CONCISE COMMUNICATION

Understanding Barriers to Optimal Cleaning and Disinfection in Hospitals: A Knowledge, Attitudes, and Practices Survey of Environmental Services Workers

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In this study, we used an online survey to assess knowledge, attitudes, and practices related to environmental cleaning and other infection prevention strategies among environmental services workers (ESWs) at 5 hospitals. Our findings suggest that ESWs could benefit from additional education and feedback as well as new strategies to address workflow challenges.

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Improvements in hospital cleaning and disinfection have been associated with reductions in healthcare-associated infection (HAI) rates[1,2] and the risk of acquiring multidrug-resistant organisms (MDROs) in hospital rooms that previously housed colonized or infected patients.[2] While cleaning and disinfection of the patient care environment is recommended to prevent transmission of pathogens,[3] studies show that surfaces in the patient care environment frequently remain contaminated after cleaning by environmental services workers (ESWs).[4–6] Understanding the knowledge, perspectives, and beliefs of ESWs and the barriers they encounter while performing their work may help to identify root causes of suboptimal cleaning and disinfection and inform interventions to ensure effective and consistent practices. We administered an anonymous survey to ESWs to assess knowledge, attitudes, and practices (KAPs) regarding HAIs, basic infection prevention and control (IP&C) strategies, and cleaning and disinfection.

METHODS

Study Sites

The study was conducted in 2015 at 5 acute-care hospitals within a single hospital network in New York, New York. The hospitals included 2 large, tertiary-care academic hospitals, a free-standing academic pediatric and women's hospital, and 2 community hospitals. At the time of the survey, a bleach-based cleaner-disinfectant was used for daily and discharge cleaning. Hospital policy required contact precautions for patients with MDROs. For patients with *Clostridium difficile* infection (CDI), contact precautions were supplemented with the requirement to perform hand hygiene using chlorhexidine gluconate soap and water, rather than an alcohol-based hand rub, before exiting the room. At 4 hospitals, a portable UV light disinfection device was used after discharge cleaning of rooms of patients with CDI. Any isolation sign present at discharge was to be left in place so ESW knew which precautions were necessary when performing discharge cleaning.

Survey Design

Questions were developed based on conversations with Environmental Services leadership and ESWs, observations of ESWs performing their duties, and questions from previous studies.[7,8] The following topics were included: (1) knowledge and feedback related to cleaning practices, (2) workflow challenges, (3) beliefs about personal safety, (4) attitudes about ESW contributions to patient safety, and (5) knowledge about HAIs and IP&C strategies. The survey included Likert-scale, multiple-choice, and free-text questions. Answering each question was optional. The survey was pilot tested with 3 ESWs, resulting in minor revisions to several of the 32 questions. Microsoft Word 2013 was used to ensure that the survey utilized a 6th grade reading level (Microsoft, Redmond, WA). The survey is available in the Online Supplementary Material. The Institutional Review Boards at Columbia University Medical Center and Weill Cornell Medical College approved this study.

Study Population and Survey Administration

ESWs at the 5 hospitals were invited by the research team to participate in the anonymous survey. The survey took approximately 10 minutes to complete, was offered online (SurveyMonkey, Palo Alto, CA) in English and Spanish, and could be completed during working hours using desktop computers and tablets. Research personnel were present at most survey administration sessions to answer questions and assist participants. Participants were eligible to enter a raffle for 1 of 86 $30 gift cards.

Analysis of Survey Responses

For each question, the percentage of respondents selecting each answer choice was calculated using the total number of eligible respondents as the denominator. Subgroup analyses compared differences in responses based on a respondent's assigned hospital and years of experience. In addition,

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χ^2 tests or Fisher exact tests were performed, as applicable. P values $< .05$ were considered statistically significant.

RESULTS

Respondents

Of 741 ESWs at the 5 hospitals, 327 (44%) participated in the survey. Table 1 shows characteristics of the respondents. Response rates among the hospitals ranged from 23% to 89%. Responses from 34 ESWs (10%) who did not clean inpatient rooms were excluded from the analysis. Furthermore, 27 respondents (8%) did not indicate whether they cleaned inpatient rooms. When responses from this group were compared to those of respondents who reported cleaning inpatient rooms, a significant difference was detected for only 1 question ("I have been taught how to do discharge cleaning properly"; 85% vs 94%; $P = .04$). Thus, the responses from these 27 respondents were included in the overall analysis. The number of responses to individual questions ranged from 262 (89%) to 292 (99%).

Knowledge and Feedback Related to Cleaning Practices

Most respondents agreed that they had been trained to properly perform daily cleaning (90%) and discharge cleaning (93%) and were "very confident" in their abilities to do so (72% and 86%, respectively). Nearly all reported "often" or "always" using the hospital-approved cleaner-disinfectant to clean surfaces around the patient bed during daily (91%) and discharge (95%) cleaning. However, 43% reported "never" or "sometimes" receiving useful feedback about their work and 28% reported "never" or "sometimes" knowing when to use the UV light disinfection device (Table 2).

TABLE 1. Characteristics of Survey Respondents

Demographic Characteristic	Respondents, No. (%)
Study facility[a]	
Hospital A	59 (18)
Hospital B	28 (9)
Hospital C	117 (36)
Hospital D	89 (27)
Hospital E	25 (8)
Not reported	9 (3)
Primary work area at study facility[a]	
Inpatient	224 (69)
Outpatient	42 (13)
Non-patient care area	34 (10)
Not Reported	27 (8)
Years of experience in environmental services at study facility[b]	
≤5 y	127 (43)
6–10 y	74 (25)
11–15 y	41 (14)
16–20 y	16 (5)
>20 y	22 (8)
Not reported	13 (4)

[a]Overall, 327 ESW provided responses to these questions.
[b]Overall, 293 ESW provided responses to this question.

Workflow Challenges

Approximately 25% of respondents reported "never" or "sometimes" having enough time to perform daily cleaning (30%) and discharge (20%) cleaning properly, and 26% reported "often" or "always" being interrupted to assist with another task. In addition, 60% reported "always" knowing the type of isolation precautions to be followed when entering a room to perform discharge cleaning, and 45% reported that it was "always" easy to identify the type of precautions required for a room without a sign posted at the time of discharge cleaning. Furthermore, 37% reported that it was "always" clear what items ESWs were responsible for cleaning. Finally, 39% reported "often" or "always" avoiding cleaning near patients to avoid disturbing them, and 40% reported that the over-bed table was "often" or "always" too cluttered to clean during daily cleaning.

Beliefs About Personal Safety

Regarding personal safety, 27% of respondents reported "often" or "always" worrying that cleaning products may be harmful to them, while 20% reported "often" or "always" worrying that they might get sick due to exposure to patients while cleaning.

Attitudes About Contributions of ESWs to Patient Safety

Most respondents (86%) agreed that their work is "very important" to keep patients safe, and 54% reported that physicians and nurses "never" or "sometimes" show appreciation for their work.

Knowledge About HAIs and IP&C Strategies

Although hospital policy and signage call for soap-and-water hand washing, 63% of respondents reported using an alcohol-based hand rub when leaving a CDI isolation room. In addition, 29% did not know that germs can be found on healthcare personnel hands. The majority (72%) expressed interest in further education. The most commonly selected topics were related to HAIs and IP&C, including "specific types of infections" (43%) and "how patients get infections while in the hospital" (40%).

Subgroup Analysis

In our subgroup analysis stratified by hospital, there were no between-group differences for questions regarding attitudes about ESW contributions to patient safety or the desire for additional education. Significant differences were noted, however, with regard to beliefs about personal safety (ie, concerns about the safety of cleaning products and about

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TABLE 2. Responses to Select Survey Questions

Survey Category and Question	Responses				
	Strongly Disagree/Never, No. (%)	Disagree/ Sometimes, No. (%)	Agree/ Often, No. (%)	Strongly Agree/ Always, No. (%)	Not Reported/ Not Applicable, No. (%)
Knowledge and feedback related to appropriate cleaning practices					
I have been taught to do daily cleaning properly	18 (6)	7 (2)	110 (38)	153 (52)	5 (2)
I have been taught to do discharge cleaning properly	8 (3)	7 (2)	99 (34)	174 (59)	5 (2)
I clean surfaces around the patient bed during daily cleaning	6 (2)	13 (4)	38 (13)	230 (78)	6 (2)
I clean surfaces around the patient bed during discharge cleaning	2 (1)	5 (2)	17 (6)	261 (89)	8 (3)
I receive useful feedback about my work	30 (10)	97 (33)	76 (26)	83 (28)	7 (2)
I know when the UV light disinfection device should be used in a patient room	17 (6)	64 (22)	48 (16)	131 (45)	33 (11)
Workflow challenges					
I have time to perform daily cleaning	11 (4)	75 (26)	64 (22)	140 (48)	3 (1)
I have time to perform discharge cleaning	8 (3)	50 (17)	60 (20)	167 (57)	8 (3)
I know the isolation type when I enter a room for discharge cleaning	6 (2)	57 (19)	47 (16)	176 (60)	7 (2)
I can easily find out the isolation type if no isolation sign is posted	33 (11)	63 (22)	57 (19)	133 (45)	7 (2)
It is clear what ESW are responsible for cleaning	37 (13)	96 (33)	48 (16)	107 (37)	5 (2)
I am interrupted during cleaning to perform another task	50 (17)	163 (56)	41 (14)	35 (12)	4 (1)
I avoid cleaning near patients to avoid disturbing them	53 (18)	119 (41)	42 (14)	72 (25)	7 (2)
The over bed table is too cluttered to clean	38 (13)	135 (46)	69 (24)	47 (16)	4 (1)
Beliefs about personal safety					
I worry that my cleaning products may be harmful to me	82 (28)	130 (44)	28 (10)	50 (17)	3 (1)
I worry I may get sick from patients while cleaning	89 (30)	142 (48)	23 (8)	37 (13)	2 (1)
Attitudes about contributions of ESW to patient safety					
My work is very important to keep patients safe	39 (13)	2 (1)	36 (12)	215 (73)	1 (1)
Doctors show appreciation for my work	45 (15)	112 (38)	23 (8)	76 (26)	37 (13)
Nurses show appreciation for my work	23 (8)	134 (46)	45 (15)	78 (27)	13 (4)

NOTE. ESW, environmental services workers.

getting sick from patients), receipt of useful feedback, and several workflow challenges, including perceptions of a lack of clear delineation of cleaning responsibilities and insufficient time available for room cleaning, and avoidance of cleaning surfaces close to patients to avoid disturbing them.

In subgroup analyses stratified by years of experience, no differences were detected with regard to beliefs about personal safety, workflow challenges, or the desire for education. Compared with respondents with 6–10 years of experience, significantly fewer respondents with >20 years of experience agreed that their work was important to keep patients safe. Significantly fewer respondents with ≤5 years of experience agreed that physicians showed appreciation for their work and that they received useful feedback about their work compared to respondents with 16–20 years of experience.

DISCUSSION

To our knowledge, this is the largest assessment of ESW knowledge, attitudes, and practices performed to date.[7,8] While the majority of ESWs expressed confidence in their abilities to conduct daily and discharge cleaning and reported that they had been taught to properly perform both processes, we identified several potential opportunities to improve knowledge, enhance feedback, and reduce workflow barriers to optimize practice. In addition, our findings suggest that many ESWs do not feel appreciated by other healthcare workers and that some do not believe that their own work is important to keep patients safe. This perceived lack of appreciation and the absence of recognition of the importance of their work may prevent some ESWs from carrying out their responsibilities adequately.

The opportunities identified by the survey were largely consistent with previous observations in these hospitals using other qualitative and quantitative methods.[9] Shadowing ESWs revealed similar barriers, including reluctance to clean around patients, miscommunication regarding cleaning responsibilities, and clutter in the patient care environment. The reported reluctance of many respondents to clean surfaces close to patients was consistent with quantitative assessments of ATP burden in the hospital environment (ie, after daily

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cleaning, surfaces closest to patients (eg, bed rails) had greater ATP burden than those further away (eg, bathroom fixtures)).[9] These additional methods support the findings of our survey and validate the use of a KAP survey to elucidate barriers to optimal cleaning and disinfection. The large sample size and the range of experience among our respondents from multiple hospitals enhance the generalizability of our findings. The survey could be used in other facilities to assess baseline KAP, identify hospital-specific challenges, and measure the impact of initiatives to enhance ESW knowledge, reduce barriers, and increase the effectiveness of cleaning and disinfection.

Several potential limitations of this study should be acknowledged. The survey may not address all potential barriers ESWs face. ESWs who chose to participate may not be representative of all ESWs. Sample sizes were relatively small in subgroup analyses, potentially limiting our ability to detect differences between groups. Many survey questions elicited ESW attitudes and beliefs and self-reported behaviors but did not assess actual practice or knowledge. The survey did not assess ESW assignments and the frequency of changing work assignments to other areas, factors that may influence a personal sense of "ownership" and, thus, quality of cleaning. Finally, although participants represented 5 hospitals, the hospitals were part of the same system, which potentially limits the generalizability of our findings.

Previous studies have found that improvements in hospital cleaning and disinfection gained through educational interventions alone may not be sustained after the conclusion of an intervention[5] and that optimal and sustained improvement may be achieved only when education is ongoing and additional strategies are implemented.[5,6] These additional strategies have included frequent feedback,[1,5,6,10] education of patients and other healthcare workers on ways to facilitate cleaning and disinfection by ESWs,[1] and hands-on demonstrations for ESWs of tests of environmental cleanliness.[5] Steps are now being taken at the participating hospitals to address the identified opportunities and barriers using these and other interventions. Through the introduction of interactive educational programs and enhanced feedback to complement existing training programs, we aim to provide ESWs with additional knowledge, empowerment, and strategies to overcome workflow barriers to assist them in optimally fulfilling their critical role on the patient care team.

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SUPPLEMENTARY MATERIAL

For supplementary material/s referred to in this article, please visit http://dx.doi.org/doi:10.1017/ice.2016.206.

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