conducted semistructured interviews with key stakeholders (ie, environmental staff, nursing, and infection preventionists) at 3 VA facilities across acute-care and long-term care settings. Interviews were conducted among 18 healthcare workers, audio recorded, and transcribed verbatim. Transcripts were analyzed for thematic content within the SEIPS constructs (ie, person, environment, organization, tasks, and tools). **Results:** Within the SEIPS domain 'person,' we found that many environment service (EVS) staff were veterans and were highly motivated to serve fellow veterans, especially to prevent them from acquiring infections. However, the hiring of service members as EVS staff comes with significant hurdles that affect staffing. Within the domain of 'environment', EVS staff reported rooms that were either occupied by the patient or were multibed, were more difficult to clean. Conversely, they reported that it was easier to clean in settings where the patient was more likely to be out of bed (eg, long-term care residents). Patient flow and/or movement greatly influenced workload within the 'organizational' domain. Workload also changed by patient population and setting (eg, the longer the stay or more critical the patient), increased their workload. EVS staff felt that staffing consistency and experience improved cleaning practices. Within the 'task' domain, EVS staff were motivated for cleaning high-touch surfaces; however, knowledge of these surfaces varied. Finally, within the 'tool' domain, most EVS staff described having effective cleaning products; however, sometimes in limited supply. Most sites reported some form of monitoring of their cleaning process; however, there was variation in type and frequency. **Conclusions:** Human-factors analysis identified barriers to and facilitators of cleaning compliance. Incorporating environmental cleaning practices that address barriers and facilitators identified may facilitate standardized cleaning of environmental surfaces. Standardized procedures for cleaning multibed rooms and environmental surfaces surrounding occupied beds may improve cleaning compliance. Future research should evaluate standardized cleaning procedures or bundles that incorporate these best practices and steps to overcoming barriers and pilot feasibility.

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Poster Presentation
Subject Category: Environmental Cleaning

Damaged Hospital Mattresses and Bed Frames Are Common in Acute-Care Hospitals

Edmond Hooker

Background: Hospital beds are now high-tech, reprocessable, medical devices. The surface of the mattress (cover) is manufactured using polyurethane-coated fabric to ensure moisture-vapor transmission to prevent pressure ulcers. In recent years, due to multidrug-resistant organisms, healthcare organizations have used increasingly harsh chemicals to clean these mattresses. None of these chemicals are approved for use on polyurethane-coated fabric. Previous research has shown that many mattresses in hospitals are damaged. The US Food and Drug Administration, Centers for Disease Control and Prevention, ECRI, and manufacturers recommend routine mattress inspection and replacement of mattresses with any visible signs of stains, wear, or damage. Damaged mattresses have been linked to fluid leakage, resulting in patient exposure and outbreaks of healthcare-acquired infections. **Methods:** Four hospitals of a midwestern hospital system had all of their mattresses inspected for damage and staining to the mattress. After external examination, each mattress was opened, and the mattress core was evaluated for damage. The cover of each mattress was examined using the naked eye and then using an LED light to demonstrate smaller holes. Each bed frame was examined for evidence of rust, and the amount of rust was recorded. If available, the age of the mattress was determined based on a label on the mattress. **Results:** In total, 727 beds and mattresses were inspected. Of these mattresses, 523 (72%) were damaged. Also, 340 (47%) required replacement of the mattress cover, and 183 (25%) required replacement of the entire mattress (cover and core). For the 209 damaged mattresses (40%) with the date of manufacture label, 156 (75%) were <4 years old. Damage to the mattress included 428 (59%) with holes in the cover: 113 (16%) were visible to the naked eye and 315 (43%) small holes only detected by using an LED light. Also 173 mattresses (24%) had stains on the exterior cover, 215 (30%) had stains on the interior of the top cover, and 192 (26%) had stains on the interior of the bottom cover. Bed-frame rust was identified on 175 (24%) beds, of which 65 (9%) had widespread rust. **Conclusions:** These findings confirm previous reports that damaged mattresses are common in hospitals and potentially place patients at risk. Most of these failed mattresses are <4 years old, which is much less than the expected life of a mattress and bed deck.

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Subject Category: Environmental Cleaning

Using Ultraviolet C (UVC) in Operating Rooms: A Hygiene Improvement

Roberta Bosco; Gabriele Messina; Davide Amodeo; Gabriele Cevenini and Simona Gambelli

Background: Disinfection procedures are an essential aspect of preventing cross contamination, especially in situations where the risk of infection is higher, such as in operating rooms (ORs). Disinfection procedures in ORs at the end of each surgery session are not the same as final cleaning procedures. We assessed the difference in microbial contamination between different levels of disinfection, before T(0) and after T(1) the use of an ultraviolet C device (UVC-D). **Methods:** A cross-sectional study was conducted between December 2019 and August 2020 in a private clinic. Three sanitation levels (SL1–SL3) were compared for the reduction in colony-forming units (CFU) between T(0) and T(1): (1) no disinfection after surgery (SL1);, (2) after in-between cleaning (SL2), and (3) after terminal cleaning (SL3). UVC-D was used for 6 minutes, 3 minutes per bed side. Overall, 260 Petri dishes were used in 3 ORs, incubated at 36°C, and CFU were counted after 48 hours. Descriptive statistics, Wilcoxon test, and MANOVA for repeated measures were performed to verify the 95% statistical difference between T(0) and T(1), both on the whole sample and combined with the different SLs. **Results:** The unstratified analysis showed statistically significant differences (Wilcoxon test, $p < 0.05$) between T(0) and T(1), with means and standard deviations of 11.42 ± SD 41.19 CFU/PD and 5.91 ± SD 30.89, respectively. The Manova test for repeated measures, applied to 54 pairs of measurements, showed no significant difference between SLs in T(0)-T(1) CFU reduction. Overall, the mean percent reduction in CFU was 93.48% (CI95% = 86.97-99.99%). **Conclusions:** The results showed significant improvements in disinfection under any condition tested with UVC-D. Using the device immediately after surgery (SL1), before standard cleaning procedures, reduced CFUs by 97.3%. In some situations, UVC light was sufficient to reduce CFU to zero, even without chemical and mechanical cleaning. However, we do not recommend this approach; UVC light disinfection should be applied only after sanitization procedures because it does not remove dirt.

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Building on the Foundation of a Sustainable Hand Hygiene Program During the COVID-19 Pandemic

Lisa Stancill; Emily Sickbert-Bennett Vavalle and Lauren DiBiase

Background: Hand hygiene is essential to preventing the spread of disease in hospitals. Renewed emphasis has been placed on hand hygiene during the COVID-19 pandemic. We investigated whether UNC Medical Center's

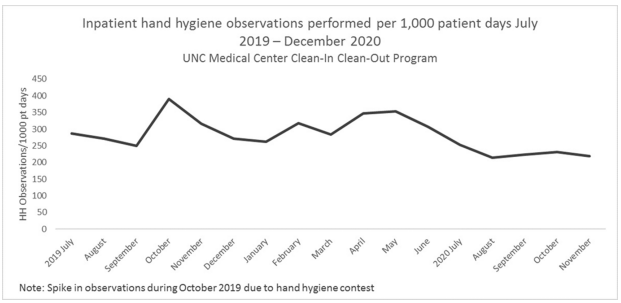

Figure 1.

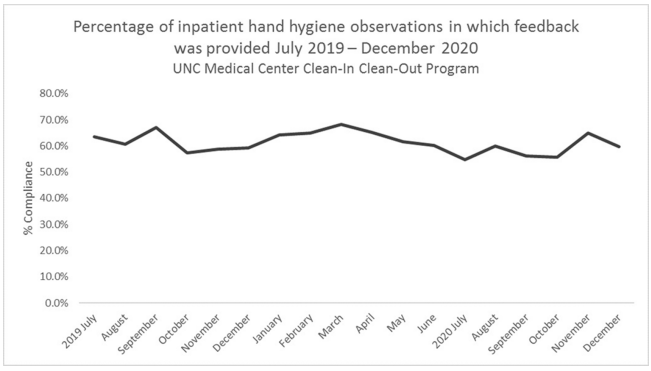

Figure 2.

well-established Clean-In Clean-Out (CICO) program for hand hygiene observations was sustainable throughout a public health and healthcare crisis and whether the COVID-19 pandemic had an effect on hand hygiene compliance. **Methods:** UNC Medical Center utilizes a crowd-sourced hand-hygiene audit application, CICO, to track hand-hygiene observations, compliance, and feedback. This application encourages participation from all staff and promotes providing real-time feedback in the form of a compliment or reminder when performing hand hygiene observations. During this evaluation, hand hygiene data were queried from the CICO application on the number of observations performed, hand hygiene compliance percentage, and feedback compliance percentage from July 2019 to December 2020. Hand hygiene data were compared to patient volumes in different care settings and the number of hospitalized patients being treated for COVID-19. **Results:** Initial increases in hand hygiene observations, compliance, and feedback were detected in the months leading up to UNC Medical Center receiving its first SARS-CoV-2–positive patient. Observations were highest when patient volumes were low due to closed clinics and restrictions on elective surgeries (Figure 1). When patient volumes returned to pre–COVID-19 levels coupled with treating more COVID-19 patients, the number of observations and compliance rate metrics declined. Feedback compliance percentage remained relatively stable through the entire period (Figure 2). **Conclusions:** Despite the additional strain on healthcare staff during COVID-19, the CICO model was a sustainable method to track hand hygiene observations and compliance. Notably, however, engagement was highest when patient census was lower, demonstrating that operating at a high capacity is not beneficial for patient safety. Due to the success and sustainment of the CICO program, UNC Medical Center used this model to create a Mask-On Mask-Up campaign to engage staff to submit observations, track compliance, and encourage feedback to promote the appropriate use of masks during COVID-19.

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Appropriate Number of Observations to Determine Hand Hygiene Compliance Among Healthcare Workers

Se Yoon Park; Eunjung Lee; Suyeon Park; Tae Hyong Kim and Sungho Won

Background: We sought to determine the minimum number of observations needed to determine hand hygiene (HH) compliance among healthcare workers. **Methods:** The study was conducted at a referral hospital. We retrospectively analyzed the result of HH monitoring from January to December 2018. HH compliance was calculated by dividing the number of observed HH actions by the total number of opportunities. Appropriate HH compliance rates were calculated based on the 6-step technique, modified from the World Health Organization (WHO) recommendation. The minimum number of required observations (n) was calculated by the following equation using overall mean value (r), absolute precision (d), and confidence interval (1-α) [The equation: $n^3 Z\alpha/22\times\rho\times1-\rho/d2$]. We considered ds of 5%, 10%, 20%, and 30%, with CIs of 99%, 95%, and 90%, respectively. Among the various cases, we focused on 10% for d and 95% for CI. **Results:** During the study period, 8,791 opportunities among 1,168 healthcare workers were monitored. The mean HH compliance and appropriate HH compliance rates were 80.3% and 59.7%, respectively (Table 1). The minimum number of observations required to determine HH compliance rates ranged from 2 (d, 30%; CI, 90%) to 624 (d, 5%; CI, 99%), and the minimum number of observations for optimal HH compliance ranged from 5 (d, 30%, CI, 90%) to 642 (d, 5%; CI, 99%) (Figure 1). At 10% absolute precision with 95% confidence, the minimum number of observations to determine HH and optimal HH compliance were 61 and 92, respectively. **Conclusions:** The minimum number of observations to determine HH compliance varies widely according to setting, but at least 5 were needed to determine optimal HH compliance.

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Table 1. Mean hand hygiene and optimal hand hygiene compliance in terms of job category and year quarter.

	Number of observations	Healthcare workers	Mean, median (IQR) HH compliance	*p*-value[a]	Mean, median (IQR) optimal HH compliance	*p*-value[a]
Total	8791	2507	80.3, 100 (66.7–100)		59.7, 75 (0–100)	
Job category				< 0.001		< 0.001
Nurse	4090	1249	90.9, 100 (100–100)		78.6, 100 (62.5–100)	
Doctor	2843	742	62.2, 71.4 (33.3–100)		27.6, 0 (0–50)	
Other	1858	516	80.8, 100 (66.7–100)		60.2, 75 (0–100)	
Quarter				0.011		< 0.001
First	2586	615	80.0, 100 (66.7–100)		59.6, 72.7 (0–100)	
Second	1805	598	78.9, 100 (60–100)		59.8, 80 (0–100)	
Third	2352	673	78.8, 100 (66.7–100)		59.1, 75 (0–100)	
Fourth	2048	621	83.7, 100 (80–100)		60.6, 80 (0–100)	

IQR, interquartile range; HH: hand hygiene.

[a] p-value determined through generalized estimating equation.

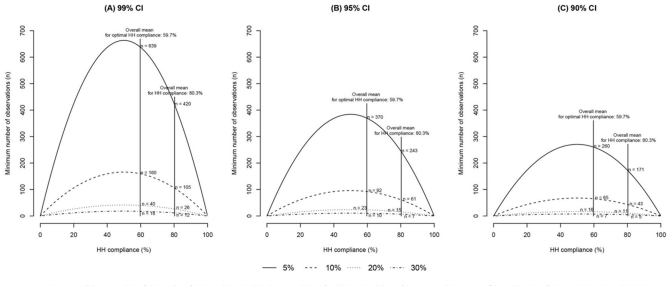

Figure 1. Minimum number of observations for determining hand hygiene compliance for absolute precisions of 5, 10, 20, and 30%, at confidence intervals of (A) 99%, (B) 95%, and (C) 90%.

Figure 1.