Pavithra Srinivas, PharmD;[1]
Thomas G. Fraser, MD;[2]
Steven M. Gordon, MD[2]

Affiliations: 1. Department of Pharmacy, Cleveland Clinic, Cleveland, Ohio; 2. Department of Infectious Disease, Cleveland Clinic, Cleveland, Ohio.

Address correspondence to Nan Wang, PharmD, Department of Pharmacy Services, University Hospitals Cleveland Medical Center, 11100 Euclid Avenue, Mather B400, Cleveland, OH 44106 (nan.wang2@uhhospitals.org).

Infect Control Hosp Epidemiol 2018;39:243–245

 0899-823X/2018/3902-0024. DOI: 10.1017/ice.2017.281

REFERENCES

1. Core elements of hospital antibiotic stewardship programs, 2014. Centers for Disease Control and Prevention website. http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.pdf. Published 2014. Accessed November 14, 2016.
2. Schiff GD, Seoane-Vazquez E, Wright A. Incorporating indications into medication ordering—time to enter the age of reason. *N Engl J Med* 2016;375:306–309.
3. Patel JA, Esterly JS, Scheetz MH, Postelnick MJ. An analysis of the accuracy of physician-entered indications on computerized antimicrobial orders. *Infect Control Hosp Epidemiol* 2012;33:1066–1067.
4. Kelesidis T, Braykov N, Uslan DZ, et al. Indications and types of antibiotic agents used in 6 acute care hospitals, 2009–2010: a pragmatic retrospective observational study. *Infect Control Hosp Epidemiol* 2016;37:70–79.

The Impact of Isolation Precautions on Hand Hygiene Frequency by Healthcare Workers

To the Editor— New systems to monitor hand hygiene (HH) can promote good practice and increase the adherence and frequency of HH.[1,2] Isolation precautions are used to reduce the risk of transmission of pathogens from known or unknown sources and to reduce the risk of direct contact with secretions or bodily fluids of patients with suspected or confirmed transmissible infections or contact with contaminated objects in the patient's environment.[3,4] This study evaluated the frequency of HH episodes among multidisciplinary team members in rooms of patients with and without isolation precautions located in 3 step-down units (SDUs).

The study was carried out from February 1, 2016, to July 31, 2016, in a private, tertiary-care hospital with 664 beds in São Paulo, Brazil. The hospital has 3 SDUs: a mixed medical surgical unit, a cardiology unit, and a neurology unit. All rooms have a single bed. The Ethics and Research Committee of the Hospital Israelita Albert Einstein approved the study.

To assess HH frequency, we used an electronic monitoring system (i-HealthSys, São Carlos, São Paulo, Brazil) that employs radiofrequency devices with sensors. One sensor is located in each employee's identification (ID) badge, another is installed in the alcohol-based hand sanitizer dispenser, and another is installed above the patient's bed. Identification data from the badge of the HCW who cleaned his or her hands are sent to the fixed sensor above the patient's bed. Using a light in the sensor above the patient's bed (green for clean hands and red for unclean hands), the HCW is notified in real time about whether HH has been done when approaching the patient's bed.

Integrated software with a database enables the generation of detailed reports with information on the presence or absence of HH events (date and time where HH occurred), duration of HCW time at the patient's bedside, the number of times the HCW cleaned his or her hands, and the manner in which and places through which the HCW passed during a certain date and time interval. If the HCW is not using the ID badge, the system records the HH event but does not identify the ID badge; therefore, the system is still able to register all HH events using the alcohol-based sanitizer.[5]

We analyzed the HH data from rooms of patients who were hospitalized for >48 hours and stratified the findings by isolation status. For isolated patients, we included patients that were on contact, airborne, and droplet precautions. During the study period, we used Charlson comorbidity index[6] data, and the Simplified Acute Physiology (SAPS 3) admission score,[7] collected upon admission to the SDU.

Isolated and nonisolated patient populations were compared. Categorical variables were described by absolute and relative frequencies, and groups were compared using a χ^2 or Fisher exact test. Numerical variables are described as medians and interquartile ranges because the data are not normally distributed. We used the Mann-Whitney test to compare numerical measures by groups.

To determine factors associated with the number of HH episodes per patient day, we analyzed simple and multiple linear regression models. The statistical package R, version 3.1.3 (R Foundation for Statistical Computing, Vienna, Austria) was used, and a $P < .05$ significance level was adopted.

In this 6-month study, 768 patients participated. We excluded 13 patients because of equipment technical failure. Therefore, we analyzed 755 patients: 561 patients with no isolation precautions (74.3%) and 194 (25.7%) patients on isolation precautions. The number of HH episodes with alcohol sanitizer per patient day ranged from 0.45 to 177.6; the median was 63.7 HH episodes per patient day.

Regarding heterogeneity between patient profiles and isolation status, patients in isolation had a shorter length of stay in the SDU ($P = .027$) but a longer total length of stay in the hospital ($P = .001$). Patients in isolation also had a higher Charlson comorbidity index ($P = .046$) and a higher probability of death according to SAPS 3 ($P < .001$). Isolated patients had more devices ($P < .001$). The median number of HH episodes per patient day was 70 for patients in isolation rooms and 62 for those without isolation precautions ($P = .040$).

Table 1 shows the estimated effects of the factors studied on the mean number of HH episodes per patient day by simple

TABLE 1. Estimated Effects for the Mean Number of Hand Hygiene Episodes per Patient Day (N = 755)

Factors	Total, No. (%)[a]	Estimated Effects[b]	*P* Value	Estimated Effects[c]	*P* Value
Step-down unit					
General	221 (29.3)				
Neurology	281 (37.2)	2.67	.305	3.77	.138
Cardiology	253 (33.5)	17.27	<.001	18.77	<.001
Age, median y (IQR)	76.00 (63.00–86.00)	0.07	.273	0.06	.380
LOS-SDU, median d (IQR)	8.00 (6.00–12.00)	0.28	.038	0.16	.255
Patient type					
Medical	623 (82.7)				
Surgical	130 (17.3)	10.35	<.001	9.18	.001
LOS, median d (IQR)	16.00 (9.00– 32.00)	0.01	.342	0.00	.877
CCI, median (IQR)	2.00 (0.00–3.00)	1.93	.001	1.42	.012
SAPS3, median (IQR)	14.54 (7.19– 27.59)	0.18	.021	0.10	.284
Tracheostomy	49 (6.5)	10.24	.020	−2.03	.704
Gastrostomy tube	94 (12.5)	7.74	.018	1.51	.691
Indwelling urinary catheter	75 (9.9)	7.16	.049	−4.63	.280
Nasogastric tube	6 (0.8)	−8.58	.483	−20.30	.094
Nasoduodenal tube	132 (17.5)	6.06	.034	−0.41	.898
Drains	53 (7.0)	18.33	<.001	8.75	.063
Other devices	50 (6.6)	7.29	.095	2.60	.550
No. of devices, median (IQR)	1.00 (1.00–2.00)	6.52	<.001	5.26	<.001
Isolation	194 (25.7)	4.76	.055	2.15	.400

NOTE. IQR, interquartile range; LOS, length of stay; SDU, step-down unit; CCI, Charlson comorbidity index; SAPS3, simplified acute physiology score, a standard equation of probability of death.
[a]Unless otherwise specified, categorical variables are described by absolute frequency and, in parenthesis, percentage.
[b]Effects on mean number of hand hygiene episodes per patient-day estimated by univariate linear model.
[c]Effects on mean number of hand hygiene episodes per patient-day estimated by multiple linear model controlling for surgical patient type, number of devices and Charlson comorbidity index.

and multiple linear regression analyses. The overall mean number of HH episodes observed was 63.3 (standard deviation, 29.8) per patient day. The mean increase in HH was 0.28 per patient day for each additional day of hospitalization ($P = .038$). Independent predictors of HH were surgical service ($P = .001$), Charlson comorbidity index ($P = .012$), and the number of devices ($P < .001$). In the presence of these 3 factors, isolation status was not significantly associated with the frequency of HH ($P = .400$).

Our electronic system of monitoring was not able to evaluate the WHO's "My 5 Moments for Hand Hygiene,"[8] and we did not evaluate the quality of HH. Patients and visitors are advised to use alcohol-based sanitizers for HH to prevent infections; therefore, employees, patients, and visitors use the dispensers placed in rooms. We do not know the proportion of use attributable to visitors.

In conclusion, our study did not show differences in HH frequency in isolated versus nonisolated patients' rooms. We demonstrated higher HH frequency for surgical patients, for patients with multiple devices in situ, and for those with a high Charlson comorbidity index.

ACKNOWLEDGMENTS

Financial support: No financial support was provided relevant to this article.

Potential conflicts of interest: Marcelo Prado and Guilherme Machado Gagliardi work for i-HealthSys. All other authors have no commercial association or financial involvement that might pose a conflict of interest in connection with this manuscript.

Sátiro Ribeiro de França, RN;[1]
Edson Américo Sant'Ana, RN;[1]
Ana Carolina Cintra Nunes Mafra, PhD;[4]
Marcelo Prado, BE;[5]
Guilherme Machado Gagliardi, BE;[5]
Michael B. Edmond, MD, MPH, MPA;[3,6]
Alexandre R. Marra, MD[2,3]

Affiliations: 1. Intensive Care Unit, Hospital Israelita Albert Einstein, São Paulo, Brazil; 2. Division of Medical Practice, Hospital Israelita Albert Einstein, São Paulo, Brazil; 3. Office of Clinical Quality, Safety and Performance Improvement, University of Iowa Hospitals and Clinics, Iowa City, Iowa; 4. Instituto Israelita de Ensino e Pesquisa Albert Einstein, Hospital Israelita Albert Einstein, São Paulo, Brazil; 5. Division of Research and Development, i-HealthSys, São Carlos, Brazil; 6. Division of Infectious Diseases, Department of Internal Medicine, University of Iowa Carver College of Medicine, Iowa City, Iowa.

Address correspondence to Alexandre Rodrigues Marra, MD, University of Iowa Hospitals and Clinics, C51 GH, 200 Hawkins Drive, Iowa City, IA 52242 (alexandre.marra@einstein.br)

Infect Control Hosp Epidemiol 2018;39:245–247

 0899-823X/2018/3902-0025. DOI: 10.1017/ice.2017.275

REFERENCES

1. Ellingson K, Haas JP, Aiello AE, et al. Strategies to prevent healthcare-associated infections through hand hygiene. *Infect Control Hosp Epidemiol* 2014;35:937–960.
2. Hagel S, Reischke J, Kesselmeier M, et al. Quantifying the Hawthorne effect in hand hygiene compliance through comparing direct observation with automated hand hygiene monitoring. *Infect Control Hosp Epidemiol* 2015;36:957–962.
3. Cheng VC, Tai JW, Chan WM, et al. Sequential introduction of single room isolation and hand hygiene campaign in the control of methicillin-resistant *Staphylococcus aureus* in intensive care unit. *BMC Infect Dis* 2010;10:263.
4. Guideline for isolation precautions 2007: preventing transmission of infectious agents in healthcare settings. Centers for Disease Control and Prevention website. http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf. Published 2007. Accessed December 5, 2017.
5. Marra AR, Edmond MB. New technologies to monitor healthcare worker hand hygiene. *Clin Microbiol Infect* 2014;20:29–33.
6. Martins M. Use of comorbidity measures to predict the risk of death in Brazilian in-patients. *Rev Saúde Pública* 2010;44(3). SciELO Brazil website. http://www.scielosp.org/pdf/rsp/v44n3/en_AO1290.pdf. Published 2010. Accessed December 5, 2017.
7. Moreno RP, Metnitz PG, Almeida E, et al. SAPS 3—From evaluation of the patient to evaluation of the intensive care unit. Part 2: Development of a prognostic model for hospital mortality at ICU admission. *Intensive Care Med* 2005;31:1345–1355.
8. Pittet D, Allegranzi B, Boyce J. The World Health Organization guidelines on hand hygiene in health care and their consensus recommendations. *Infect Control Hosp Epidemiol* 2009;30:611–623.

Adherence to HIV Postexposure Prophylaxis in a Major Hospital in Northwestern Nigeria

To the Editor—Of crucial importance in the success of HIV postexposure prophylaxis (PEP) is adherence to the 28 days course of antiretroviral treatment (ART).[1] Nevertheless, uptake of HIV PEP is acknowledged to be insufficient, with <60% of the individuals who started PEP treatment finishing the full course.[2] It is important to determine why HIV PEP adherence remains a challenge across different populations, settings, and exposures.[2] Previous studies have reported higher PEP treatment completion rates with a 2-drug regimen compared to a 3-drug regimen.[2,3] One reason for noncompletion of treatment is the adverse effects of ART used for PEP.[4,5] In this study, HIV PEP treatment adherence was defined as initiating PEP treatment following occupational exposure to HIV, returning to pick up subsequent doses, and completing the rest of the PEP course as well as follow-up visits. Those that failed to adhere to PEP treatment were classified as defaulters. We examined the predictors of PEP default in a tertiary-care hospital in northwestern Nigeria.

This retrospective cohort study was conducted at a major tertiary-care hospital that is home to the largest antiretroviral treatment (ART) center in northwestern Nigeria. The ethics committee of the hospital approved this study.

We examined details of all reported incidences of occupational exposures to an HIV-positive source that occurred within the hospital from October 2004 to December 2016. In total, 70 healthcare workers exposed to HIV positive sources took PEP during the study period, and 51 patients completed the treatment while 19 defaulted (27%).

As shown in Table 1, our study revealed that those on a non–tenofovir-containing regimen were 2.6 times more likely to default PEP compared to those on a tenofovir-containing regimen ($P = .0199$). This finding may be related to the better tolerability of the tenofovir-based regimen compared to the zidovudine-based regimen, as reported by previous studies.[6,7] We also found that patients prescribed 3 pills for HIV PEP were more likely to default than those prescribed 2 pills. This finding was not statistically significant. Previous studies have reported a higher PEP regimen completion rate with low pill burden.[8,9] Another finding, which was also not statistically significant, was that nonphysicians

TABLE 1. Examining for Predictors of PEP Default in Bivariate Analysis

Predictor	Category	Defaulted, n/N	Nondefaulted, n/N	Relative Risk (CI)	Pearson χ^2	*P* Value
Pill burden	3 pills	6/19	12/51	1.33 (0.596–2.983)	0.47	.493
	1 or 2 pills	13/19	39/51			
Regimen	[a]Non-TDF regimen	13/19	19/51	2.57 (1.105–5.992)	5.42	.0199
	TDF-based regimen	6/19	32/51			
Station of staff	Medical units	13/19	34/51	1.06 (0.463–2.429)	0.02	.889
	Surgical units	6/19	17/51			
Category of staff	[b]Nonphysician	12/19	24/51	1.62 (0.723–3.624)	1.44	.231
	Physician	7/19	27/51			

NOTE. CI, confidence interval; TDF, tenofovir; ART, antiretroviral treatment.
[a]Specifically refer to combination ART that excludes tenofovir but includes a combination of zidovudine, lamivudine, stavudine, efavirenz, and nevirapine.
[b]Refers to a nurse, laboratory scientists, health attendants, and students.

https://doi.org/10.1017/ice.2017.275 Published online by Cambridge University Press