American Journal of Infection Control 47 (2019) 585–587

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief Report

Who goes in and out of patient rooms? An observational study of room entries and exits in the acute care setting

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Key Words:
Hand hygiene performance
Hand hygiene performance monitoring
Automated hand hygiene monitoring
Patient hand hygiene
Visitor hand hygiene
Aggregate compliance monitoring

The objective of this study is to determine what percentage of patient room entries and exits (opportunities) are attributed to health care personnel (HCP) and non-HCP. A total of 14,876 opportunities were observed by clinicians in 29 units of 16 hospitals. HCP accounted for 83.6%; 95% confidence interval, 81.3%-87.6%. This finding provides hospitals an initial baseline for HCP room traffic when implementing community-based automated hand hygiene monitoring and compliance improvement efforts.

BACKGROUND

Health care facilities can use electronic compliance monitoring, also known as automated hand hygiene monitoring systems (AHHMS), to complement direct observations of hand hygiene (HH) compliance of health care personnel (HCP).[1] AHHMS vary in their capacity to capture data. For example, some systems capture data at the person-specific level requiring HCP to wear specialized electronic badges, whereas other systems capture data at the community level (eg, unit level, no badges). For community systems, entering or exiting an occupied patient room by any person is considered an opportunity for HH, and dispenser use by any person is captured as well and is considered an HH event.[2,3] These innovative AHHMS technologies use different approaches to determine the opportunities (ie, denominator) for HH, but nevertheless can be value-added tools in a multimodal strategy to improve HH.

One challenge of the community-level approach is that it does not identify who is accountable for the patient room entries or exits contributing to the opportunities for HH. Total numbers of opportunities from non-HCP (eg, patients, visitors, and others) may be overestimated. It is important to address this challenge because if HCP do not understand the impact that patients, visitors, and others have on community-level data, they may attribute a lower-than-expected compliance rate to non-HCP, thereby forfeiting ownership, accountability, and team engagement (GOJO unpublished data, 2018). Undeniably, observational studies have shown visitor and patient HH compliance rates to be very low.[4-6] Although HCP are the focus of most HH initiatives, HH by patients and visitors is also important to prevent the acquisition and transmission of pathogens. A whole system approach that encourages more compliance among visitors and patients, with HCP taking ownership of visitor compliance on their units is ideal. Nevertheless, because the number of opportunities generated by patients and visitors is unknown, it is not clear how non-HCP impact HH compliance rates. Therefore, the objective of this study is to determine what percentage of patient room entries and exits can be attributed to HCP and non-HCP.

METHODS

Opportunities (defined as patient room entry or exit) were observed and recorded by 6 clinicians (5 registered nurses and 1 registered respiratory therapist) employed by GOJO Industries during PURELL SMARTLINK Activity Monitoring System (GOJO Industries, Akron, OH) installation and validation. Unit HCP were informed that the observers were counting the frequency and role of individuals entering and exiting patient rooms.

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E-mail address: arbogasj@gojo.com (J.W. Arbogast).
Funding/support: This work was funded by GOJO Industries, Inc.
Conflicts of interest: None to report.

https://doi.org/10.1016/j.ajic.2018.10.013

Observations were made via convenience sampling in 29 units of 16 hospitals in the United States and Canada. Unit types observed were: emergency department, intensive care unit, medical surgical, oncology, and pediatrics. Units varied in size from 10-41 beds. Observers moved throughout the unit to collect data from all occupied patient rooms observable from a location in the hallway. The observer could only see certain rooms at a time and would not be able to see who was entering or exiting other rooms. Data was not necessarily collected on each patient room. Also, the observers moved throughout the unit so that there was time spent in every hallway (therefore, each patient room was observed in aggregate). Monitoring sessions could be continuous or over several shorter sessions that typically summed to 1-3 hours across shifts or multiple days.

Each entry and exit of a patient room was counted as a separate opportunity (eg, if an individual entered a patient room then exited, this activity counted as 2 opportunities). Observers identified the individuals using the following categories: unit HCP (eg, nurses and nurse aides), non-unit HCP (eg, physicians, environmental services, and physical therapy), patients, visitors, and other (eg, clergy and hospice workers), which were then simplified to 3 categories: HCP, non-HCP, and other. In 5 units, observations did not distinguish between unit HCP and non-unit HCP. In 13 units, observers did not distinguish between patients and visitors. The time of the observation period was recorded, as well as room exits and entrances.

Logistic regression with random effects for observers, hospitals, and units nested in hospitals was used to compare observed shifts (ie, day [7:00 AM to 3:00 PM], afternoon [3:00 PM to 11:00 PM], and night [5:00 AM to 7:00 AM]) and the 5 types of units. The effect of the unit size and hospital was assessed by including a covariate for the number of beds. Wald tests[7] were performed to compare shifts and unit types, and likelihood profiles were used to generate confidence intervals (CIs) for comparisons of interest.

RESULTS

Observers recorded 14,876 opportunities in 29 units of 16 hospitals. The mean number of observations per unit was 513. A small percentage (0.7%) of opportunities involved individuals categorized as other (eg, clergy and hospice workers). HCP were responsible for ≥75% of the opportunities in each of the 16 hospitals (Table 1), 83.6% over all hospitals (95% CI, 79.9%-90.5%).

When analyzing opportunities by units, HCP were responsible for >76% of the opportunities in all but 3 units (Table 2). The percentage of opportunities attributed to HCP was not significantly associated with unit size, as measured by bed number 6.2% decrease in odds of HCP for every 10 beds (95% CI, 22%-28%, $P = .612$). In 24 of the 29 units, it was possible to distinguish between unit HCP and non-unit HCP (data not shown). Of the 12,564 opportunities observed in those 24 units, 7,038 (56.0%) involved unit HCP, 3,710 (29.5%) non-unit HCP, and 1,757 (14.0%) visitors and patients.

Pediatric units showed a 42% lower odds of HCP opportunities (or the equivalent of a 72% higher percentage of patient- and visitor-related opportunities) compared with adult units ($P = .0111$). Table 2 shows the adult units had similar percentages for HCP (67.1%-93.7%) and patients and visitors (6.3%-17.4%).

Observations were assigned to specific shifts when possible: day (5,306, 36%), afternoon (2,870, 19%), and night (253, 2%), with 6,447 crossed over 2 shifts (eg, 500 observations obtained between 1:00 PM and 5:00 PM, where 1:00 PM to 3:00 PM would be considered the day shift and 3:00 PM to 5:00 PM would be considered the afternoon shift). The odds of HCP entering and exiting relative to non-HCP was 4.7 times (370%) higher at night compared with either day or afternoon shifts (odds ratio = 4.7; $P < .0001$). There was a 15% decrease in odds in afternoon shifts compared to day shifts ($P = .027$).

DISCUSSION

This publication quantifies patient room opportunities attributable to various types of individuals in 16 hospitals and a wide variety of units with a large number of total observations. In reviewing the literature, 1 other study found that nurses and visitors comprised the most frequent entries and exits into patient rooms.[8] For HCP to use the data generated from the system to change HH behavior, they must be able to understand the data and apply meaning to it.[9] Educating HCP on who goes in and out of patient rooms may help build trust in the system and increase accountability. Health care facilities implementing community-level AHHMS will benefit from performing direct observation audits in each location to determine the AHHMS accuracy and their own estimates of HCP and non-HCP opportunities.[10]

The validity of these results is strengthened by a large number of observations in multiple centers and multiple care settings (the 16 hospitals represent a broad portion of the United States and 1 Canadian province). Although there was substantial variability across facilities, units within facilities, and observers, trends were still determined, which suggests that these results are pertinent to other facilities and units similar to the ones that we studied. Small hospital studies do not confer this same scope of inference. However, our limitations did not account for the day of the week, regional differences

Table 1
Summary of patient room entry and exit opportunities by hospital

Hospital	No. of opportunities	Total HCP (%)	Total visitors and patients (%)	No. of beds per hospital
A	634	565 (89.1)	69 (10.9)	397
B	722	607 (84.1)	115 (15.9)	557
C	1,175	893 (76.0)	179 (15.2)	100
D	360	299 (83.1)	61 (16.9)	100
E	1,833	1,595 (87.2)	238 (13.0)	532
F	218	200 (91.7)	18 (8.3)	215
G	2,400	2,104 (87.7)	296 (12.3)	300
H	702	547 (77.9)	155 (22.1)	350
I	428	353 (82.5)	75 (17.5)	732
J	1,381	1,187 (89.0)	194 (14.1)	700
K	474	394 (83.1)	80 (16.9)	58
L	868	683 (78.7)	185 (21.3)	159
M	945	781 (82.7)	116 (12.3)	1550
N	304	269 (88.5)	35 (11.5)	150
O	716	671 (93.7)	45 (6.3)	209
P	1,716	1,291 (75.2)	425 (24.8)	178

HCP, health care personnel.

Table 2
Summary of patient room entry and exit opportunities by unit type

Unit type (no. of units)	Hospital	No. of opportunities	Total HCP (%)	Total visitors and patients (%)	No. of beds per unit
ED (2)	J	1,381	1,187(86.0)	194 (14.1)	41
	K	474	394 (83.1)	80 (16.9)	10
ICU (4)	G	643	567 (88.2)	76 (11.8)	12
	G	672	625 (93.0)	47 (7.0)	12
	I	249	205 (82.3)	44 (17.8)	26
	M	945	781 (82.7)	116 (12.3)	20
Med Surg (13)	A	634	565 (89.1)	69 (10.9)	22
	B	722	607 (84.1)	115 (15.9)	20
	C	596	400 (67.1)	104 (17.4)	27
	C	579	493 (85.2)	75 (13.0)	16
	E	299	274 (91.6)	25 (8.4)	41
	E	275	238 (86.6)	37 (13.5)	41
	E	714	635 (88.9)	79 (11.1)	41
	G	681	547 (80.3)	134 (19.7)	19
	G	404	365 (90.4)	39 (9.7)	17
	I	179	148 (82.7)	31 (17.3)	30
	L	868	683 (78.7)	185 (21.3)	25
	N	304	269 (88.5)	35 (11.5)	36
	O	716	671 (93.7)	45 (6.3)	23
Oncology (2)	E	545	448 (82.2)	97 (17.8)	30
	F	218	200 (91.7)	18 (8.3)	13
Adult units total	13 hospitals, 21 units	12,098	10,302 (85.2)	1,645 (13.6)	522
Pediatric (8)	D	79	50 (63.3)	29 (36.7)	36
	D	116	90 (77.6)	26 (22.3)	36
	D	165	159 (96.4)	6 (3.6)	36
	H	702	547 (77.9)	155 (22.1)	15
	P	526	412 (78.3)	114 (21.7)	28
	P	460	351 (76.3)	109 (23.7)	28
	P	374	315 (84.2)	59 (15.8)	24
	P	356	213 (59.8)	143 (40.2%)	24
Pediatric total	3 hospitals, 8 units	2,778	2,137 (76.9)	641 (23.1)	227
Total of all units	16 hospitals, 29 units	14,876	12,436 (83.6)	2,286 (15.4)	749

ED, emergency department; *HCP*, health care personnel; *ICU*, intensive care unit; *Med Surg*, medical surgical.

that may come from culture, and weather, and fewer observations were made at night (during which 94.9% of opportunities were from HCP). Future studies can improve the strength of the conclusions with equal representation of all shifts.

CONCLUSIONS

Ultimately, AHHMS can provide robust actionable data for managing risks associated with both HCP and non-HCP from a whole clinical system perspective and help us to learn more about HH behavior. AHHMS as a complement to direct observation can be a value-added tool in a multimodal HH strategy.

Acknowledgments

The authors would like to thank Jane Kirk and Jeff Quinn, who contributed to the initial data collection and analysis, and Mia DeFino, MS, a freelance medical writer and editor under contract with Writing Assistance, Inc, for medical writing and editing support. We would also like to thank each hospital for opening the doors to us and their minds to a new HH performance approach.

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