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Original Research Article

An average hand hygiene day for nurses and physicians: The burden is not equal

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Background: To understand whether the burden of hand hygiene contributes to poor compliance we measured the daily number of hand hygiene opportunities (HHOs) by shift for nurses and physicians in 2 wards in a 850-bed university teaching hospital.

Methods: On each ward 4 trained auditors collected the number of HHOs and compliance events for 24 hours over 7 days. Twenty-one thousand four hundred fifty HHOs were collected from a medical and a surgical ward. The proportion of alcohol-based handrub used daily, the burden of hand hygiene, and compliance rates were calculated separately for nurses and physicians.

Results: The average indication for alcohol-based handrub cleansing represented 68% of all HHOs. Nurses had an average burden of 55 HHOs per 24 hours or 27 HHOs per shift, 3 times higher than the burden for physicians, who had 16 HHOs per 24 hours or 8 HHOs per shift. Overt observations of the weekly compliance identified nurses had 1.5 times higher compliance than physicians: 76% and 52% ($P < .01$), respectively.

Conclusions: Nurses have 3 times more HHOs than physicians, yet nurses have 1.5 times higher compliance than physicians. Hand hygiene compliance in physicians cannot be explained by burden of HHOs.

BACKGROUND

The most cost-effective method for the prevention of health care-associated infections is high hand hygiene compliance by health care workers (HCWs).[1-3] The World Health Organization developed the practice of My 5 Moments for Hand Hygiene,[4] which was adopted by Australia, requiring HCWs to be audited for compliance as a mandatory patient safety activity in every public hospital.[5] This national activity, which takes thousands of human hours to collect a minimum number of observations and collate the data, does not provide HCWs with feedback on performance for weeks or months.[6] The audit results are reported on the MyHospitals web site for public scrutiny[7] and the average compliance in Australia on this web site is currently reported at 82%.[5] This high compliance level is likely the result of the Hawthorne effect[8] and defective methodology.[6] Although HCWs understand that hand hygiene compliance will be linked to health care-associated infections, in particular *Staphylococcus aureus* bloodstream infection,[9-11] the actual hand hygiene compliance remains lower than that publicly reported.[5,7] Yet, from a systematic review[2] the global estimated aggregated median compliance rate for HCWs is 40% and physicians are estimated to have a median compliance of 32%, half that of the current reported compliance by Australian HCWs. Auditors, mainly nurses sourced from other wards, estimated the average compliance for Australian physicians at 71%.[5] Rates for physicians could be affected by measurement bias due to nurses auditing physicians.[12] However, we identified in a previous study that the physicians' rate is more likely to be unreliably high due to small sample sizes.[6] To understand the reasons for poor hand hygiene compliance by physicians, studies have suggested the most common barriers include lack of time, workload pressures, lack of knowledge, poor role modeling by other health care professionals, and poor organizational support.[13-15] To help understand the perception that a high burden of hand hygiene may contribute to poor

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compliance we measured the burden by measuring the total number of hand hygiene opportunities (HHOs) for 2 major health care professions. We report, for the first time, the daily HHOs for nurses and physician in a large teaching hospital.

METHODS

The project was undertaken in 2 acute care wards in the large university teaching hospital located in Sydney, Australia, which has 850 acute care beds. The observation wards included a surgical ward and a medical ward. Ethics approval of this project was obtained from the Ethics and Research Governance Office, the South Western Sydney Local Health District, and the University of New South Wales.

Only HHOs performed in view of the auditors were recorded continuously for 24 hours for 7 days during October 2013. Data were collected for ward, profession, indications (type of moment), and action (use of alcohol-based handrub [ABHR] or soap and water wash), day shift (7:00 a.m.-6:59 p.m.), night shift (7:00 p.m.-6:59 a.m.), weekday, and weekend. The audits of hand hygiene compliance were carried out by hospital gold standard auditors accredited by the National Hand Hygiene Initiative[16] and therefore did not require further training to undertake audits for this project. Each ward had 4 auditors, 2 located at either end of a ward for 24 hours. Auditors collected data using the National Hand Hygiene Initiative observation form[5] and were unobtrusive during their observations. The human auditors observed HCWs' interaction with patients and the patient zone to collect the total number of HHOs (denominator) and compliance events (numerator) stratified by indication. A total of 21,450 HHOs were recorded during the 7 days of observation. Data were analyzed by day, then aggregated for averages for weekday and weekend, shift, and ward. There were 861 missing data for shift from the medical ward for 7 days and 1,343 missing data for shift from the surgical ward.

Analysis

Data were aggregated for all HCWs or stratified by only nurses and physicians.

Method of cleansing

The contribution of ABHR and soap and water washing was expressed as a proportion of all HHOs and calculated for weekday and weekend.

Burden of opportunities by profession

HHOs were stratified by ward for weekday, weekend, shift, and profession and were expressed as proportions. The proportion of the burden of HHOs was calculated by adding all HHOs contributed by all HCWs for the trial period. The average number of HHOs was calculated for each ward and divided by averaging the total weekly HHOs. The average number of HHOs per day or night shift was calculated for each ward by dividing the total HHOs for that 12-hour shift aggregated for 7 days. The average number of HHOs per patient per shift was calculated by averaging the number of HHOs per shift divided by average bed occupancy. The average bed occupancy for the medical ward was 23.7 and was 20.1 in the surgical ward. The average burden of HHOs for nurses and physicians per 24 hours was calculated by averaging the HHOs for each profession divided by total number of staff for that profession for a 24-hour period and shift. On average the total number of nurses was 23 and 11 physicians on the medical ward and 15.1 nurses and 11 physicians on the surgical ward.

Compliance

The rate of compliance for nurses and physicians was initially stratified by ward. Physicians' rates in both wards were 20 and 27 percentage points (PP) lower than nurses' rates in the medical and surgical wards, respectively. Because the difference in compliance by physicians was just 7 PP across the 2 wards the ward data were aggregated for physicians' rate of compliance. The rates of compliance, stratified by nurses and physicians, were aggregated for shift and ward to provide a rate separately for each of the 5 moments, expressed as a percentage. The PP differences were calculated by deducting the lowest percentage from the highest percentage. Because the PP differences in compliance between the weekday and weekend were small—6 PP for nurses and 1 PP for physicians—the weekend and weekday data were aggregated. Differences in rates by moment were tested using a χ^2 test. Analysis was performed using Stata version 12 software (Stata Corp, College Station, Tex). All proportions were rounded up at 0.6 and rounded down at 0.5. The χ^2 test was used for calculating *P* values and alpha was set at the 5% level.

RESULTS

Method of cleansing for all opportunities observed during a 24-hours per day, 7 days per week period

Each ward was observed to have between 7,059 and 7,402 compliance events, of which ABHR contributed 64%-72% of all actions during the weekdays and 63%-75% on the weekend (Table 1).

Proportion of burden of HHOs observed during a 24-hours per day, 7 days per week period, by profession

The proportion of HHOs for nurses in either ward over the weekdays or the weekend did not differ by more than 12 PP (Table 2). Of the total number of HHOs, nurses had 63%-68% of the burden of all opportunities. Across both wards the average burden of opportunities during weekdays for nurses was 5 times greater than the burden for physicians and 6-9 times greater on weekends. During an average day shift nurses were observed to have 4-5 times more HHOs than physicians and during a night shift had 10-15 times more HHOs than physicians. The percentage of contribution of HHOs by physicians was stable across both wards, changing by 1-5 PP for weekdays, weekends, and shifts.

Number of HHOs observed during a 24-hours per day, 7 days per week period, per shift

During an average 24-hour period there were 1,532 HHOs on a ward (Table 3). The difference in total number of HHOs across the

Table 1
Method of cleansing for complied hand hygiene opportunities observed during a 24 hours a day, 7 days per week period

	Medical ward			Surgical ward		
	Alcohol-based handrub	Handwash	Total	Alcohol-based handrub	Handwash	Total
Weekday	72% (3,505)	28% (1,385)	4,890	64% (3,681)	36% (2,102)	5,783
Weekend	75% (1,621)	25% (545)	2,166	63% (1,015)	37% (604)	1,619