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Major Article

Quantifying the Hawthorne effect using overt and covert observation of hand hygiene at a tertiary care hospital in Saudi Arabia

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Introduction: Although direct human observation of hand hygiene (HH) is considered the gold standard for measuring HH compliance, its accuracy is challenged by the Hawthorne effect.
Objectives: To compare HH compliance using both overt and covert methods of direct observation in different professional categories, hospital settings, and HH indications.
Methods: A cross-sectional study was conducted in 28 units at King Abdulaziz Medical City, Riyadh, Saudi Arabia, between October 2012 and July 2013. Compliance was defined as performing handrubbing or handwashing during 1 of the World Health Organization 5 Moments for HH indications (ie, opportunities). Overt observation was done by infection preventionists (IPs) who were doing their routine HH observation. Covert observation was done by unrecognized temporarily hired professionally trained observers.
Results: A total of 15,883 opportunities were observed using overt observation and 7,040 opportunities were observed using covert observation. Overall HH compliance was 87.1% versus 44.9% using overt/covert observations, respectively (risk ratio, 1.94; $P < .001$). The significant overestimation was seen across all professional categories, hospital settings, and HH indications.
Conclusion: There is a considerable difference in HH compliance being observed overtly and covertly in all categories. More work is required to improve the methodology of direct observation to minimize the influence of the Hawthorne effect.

Approximately 7.5% of patients admitted to hospitals in developed countries and 10% in developing countries end up with health care-associated infections.[1] Between 20% and 40% of these infections may be directly attributed to transmission from contaminated hands of health care workers (HCWs).[2] Therefore, hand hygiene (HH) is considered the single most important strategy to reduce the incidence of health care-associated infections.[3,4] Additionally, it is a core element for preventing the spread of antimicrobial resistance and reducing colonization of multiresistant microorganisms.[5,6] Therefore, it is among the critical indicators for patient safety required by hospitals to be granted accreditation.[7] Although the benefits of HH are well known and noncontroversial, the HH compliance in health care settings is still suboptimal, with an average compliance rate of 40%.[8]

Monitoring HH compliance serves multiple functions: it stimulates HCWs to improve their performance, helps to improve infrastructure design, and works as objective assessment of the

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quality of care.[9,10] Our institution has been conducting HH observations for more than 10 years. We were concerned with the accuracy of the reported high compliance. Although direct human observation of HH practices is considered the gold standard for measuring HH compliance,[9,11] its accuracy is challenged by interobserver variability and the Hawthorne effect.[9,12] The latter, which is defined as a change in HCW behavior because of the awareness of being observed, is known to overestimate compliance rates.[13-15] The influence of Hawthorne effect may be variable in high- or low-compliant hospital locations.[16]

Covert observation was suggested as a tool to quantify or overcome Hawthorne effect bias.[17-19] Few studies tried to quantify the amount of overestimation of HH compliance using the overt or covert methods in different hospital settings, indications, and professional categories.[15,20] However, these studies either did not use the standard World Health Organization (WHO) 5 Moment methodology or observed an insufficient number of HH opportunities for appropriate stratification of data. Additionally, such data are absolutely lacking in Saudi Arabia. The objective of the current study was to compare HH compliance using overt or covert methods of direct observation in different professional categories, hospital settings, and HH indications.

METHODS

Setting

The current study was conducted at King Abdulaziz Medical City-Riyadh (KAMC-R), Ministry of National Guard Health Affairs in Saudi Arabia. KAMC-R is a 1,000-bed tertiary care facility that is funded by the government. It provides health care services for about 750,000 Saudi National Guard soldiers, employees, and their families. The care provided ranges from primary and preventive care to tertiary care. At the time of the study, approximately 9,170 HCWs were working for KAMC-R in jobs that involved direct patient care, including approximately 1,670 physicians, 4,660 nurses, and 2,840 other HCWs. KAMC-R has a multisection emergency department (150 beds), 13 different intensive care units (ICUs) (total of 185 beds), and 36 wards covering all other specialties. At the time of the study, the emergency department was serving more than 250,000 visits a year, ICUs were serving 5,000 admissions a year, and wards were serving 27,000. The data about KAMC-R–served populations and HCWs were obtained from the annual census reports for 2013 and 2014.

Population

The study targeted clinical HCWs (who were directly involved in patient care) in different departments of KAMC-R, including physicians, nurses, and other HCWs. The latter included therapists, technicians, laboratory personnel, emergency medical service personnel, dental personnel, and pharmacists. Nonclinical HCWs not directly involved in patient care such as clerical, dietary, laundry, security, maintenance, and administrative jobs were not included.

Study design

A cross-sectional study design was conducted at KAMC-R between October 2012 and July 2013. The study received all required ethical approvals from King Abdullah International Medical Research Center, Riyadh, Saudi Arabia, before data collection. Overt observation was done by presumably well-recognized infection preventionists (IPs) who were doing their routine HH observation during the study period. Covert observation was done by presumably unrecognized temporarily hired professionally trained observers during the same period.

Study outcome

HH compliance was defined as doing either handrubbing (with alcohol-based formulation) or handwashing (with soap and water) during 1 of the WHO 5 Moment HH indications (ie, opportunities): before patient contact, before an aseptic task, after exposure to body fluids, after patient contact, and after contact with patient surroundings.[21] More than 1 indication falling into the same opportunity was allowed.

Data collection

For the overt observation, a standard WHO HH observation form (with space for 32 opportunities) was used in collecting HH compliance per WHO methods.[21] The data of more than 1 HCW of different specialty were collected on the same form. Data collection was performed by IPs who were routinely collecting HH data for at least 6 months for the infection control department. For the covert observation, WHO HH observation forms (slightly modified to allow the data of only 1 HCW to be collected on the same form) were used in collecting HH compliance per WHO methods. Observation of the same HCW was continued until the session ended or 20 HH opportunities were observed. Data collection was performed by 2 temporarily hired observers who passed a training test on official WHO HH videos containing standard scenarios as well as real hospital settings. Additionally, validation of HH observation was done by occasional concomitant observation by a senior IP, with almost identical findings ($\kappa > 0.9$). The temporarily hired observers doing covert observation wore nursing uniforms but their monitoring task was not revealed to the observed HCWs. In both observation methods, HH observation was done in a series of sessions no more than 30 minutes (mean, 20 ± 10 minutes) each. Data collection from the same unit was continued until at least 200 HH opportunities were observed. Additionally, HH observation was done quietly without attempts to promote HH compliance or provide performance feedback to HCWs.

Statistical methods

Categorical variables are presented as frequencies and percentages, whereas continuous variables are presented as means ± standard deviation. The χ^2 or Fisher exact test, as appropriate, was used to test significant differences in HH compliance between overt and covert observation. Additionally, risk ratio (RR) and odds ratio (OR) for HH compliance using overt compared with covert observations were calculated using standard ways of calculations. Student *t* test or Mann-Whitney *U* test, as appropriate, was used to test significant differences in continuous variables between the overt and covert observations. All *P* values were 2-tailed. A *P* value < .05 was considered significant. SPSS version 23.0 (IBM-SPSS Inc, Armonk, NY) was used for all statistical analyses.

RESULTS

As shown in Table 1, a total of 15,883 opportunities were observed during 725 observation sessions done using overt observation across 270.9 hours of observations. On the other hand, a total of 7,040 opportunities were observed during 298 sessions done using covert observation across 148.8 hours of observations. For the 2 observation methods, the majority of the observed HCWs were nurses (62.2% and 58.7%). With slight differences between the 2 observation methods, the majority (48.3%) of all opportunities were observed