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An examination of covert observation and solution audit as tools to measure the success of hand hygiene interventions

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Abstract

Background: Many studies have examined hand hygiene (HH) frequency and adherence in response to various interventions. This study used two methods to determine HH frequency and adherence to see how well the outcomes correlated.

Method: Hand hygiene frequency was measured over 4 one-month periods (phases 1-4), using two methods: an audit of hand hygiene solution used during each phase adjusted for patient days, and covert observation of HH adherence. The number of X-ray technician contacts with patients (a known quantity) across the study period was retrospectively compared with the number of observations made of X-ray technicians HH behaviour to see what proportion of contacts were observed.

Results: HH solution use doubled in phase 2, and was 65% and 55% higher than the baseline level in phases 3 and 4. Observed HH adherence fell from 51% to 37% in phase 2, and then rose to 58% in phases 3 and 4. Three percent of X-ray technicians' patient contacts were observed across the four phases.

Conclusions: Observation of HH may not adequately sample patient contacts to provide an accurate measure of HH adherence. Further studies are needed to confirm this finding (Am J Infect Control 2006;34:95-9).

Introduction

Adherence with hand hygiene (HH) policies and procedures is an important tool in the infection control arsenal. Many studies have examined HH adherence in different settings, and the effects of various strategies on HH frequency (for a review of 34 HH studies see Boyce and Pittet¹).

Different methods were used in these studies to determine hand hygiene frequency or adherence in response to interventions. Some studies used measurement of the quantity of HH solution used as a function of patient days either by audit²⁻⁵ or via the use of devices that count the number of aliquots of HH solution used,⁶ others relied on self-report by health care workers on questionnaires,^{7,8} and many studies used either overt or covert observation of HH practice (see a selection published in the last decade⁹⁻²¹). Observational studies may be further divided into those where the observation is scheduled at particular times and is limited to particular beds or where the observation is carried out randomly and covers any interactions the data collector sees during that period.

While it is imperative that the tools used to measure adherence do so accurately, there has been little research to determine how accurate these methods are for determining HH adherence. Moret et al²² found that self-reported adherence and observed adherence correlated closely, however, the staff were aware that the observation was taking place, which may have influenced the results. The fact that their baseline level of adherence was 74%, which is high, suggests that this is the case. Conversely, Tibballs¹¹ found that doctors reported a 73% adherence to HH guidelines, while the

observed rate of adherence during the same period was 10%. Similarly, O'Boyle and Henly¹⁸ found a low correlation between self-reported and observed adherence to handwashing recommendations in study of critical care nurses despite the fact that the subjects were aware they were being observed.

These studies illustrate that observation is used as tool to measure the accuracy of other forms of measurement of HH such as self-report, yet the observational method has not itself been adequately examined for accuracy in this context.

There is evidence in the literature that observer bias, a systematic error produced in data by an observer's expectations or prior experience, can be a problem in observational studies.²³ In hand hygiene studies this may translate as an observer who has an expectation (conscious or unconscious) that a particular professional group is less likely to perform HH than others, or that HH adherence will increase or decrease in particular situations. This expectation may be based on knowledge of previous study outcomes, or on the observer's own previous observations. An additional issue for researchers to consider is ensuring that the population under study is adequately sampled to ensure an accurate representation of their behaviour.

The aim of this study was to use two methods to determine HH frequency, audit of solution use and covert observation, to see how well the outcomes correlated. This study was part of a larger study that examined the effects of a theory-based intervention on hand hygiene frequency, nosocomial infection rates and antibiotic usage in the ICU environment.

Methods

Setting

The study was carried out in a general adult 12-bed Intensive Care Unit (six beds separated by curtains and six isolation rooms) in a 450-bed Australian teaching hospital. Each isolation room had its own sink and there were six sinks available for the non-isolation bays, although the latter were located outside the bays. A choice of three hand-sanitizing solutions was available at each sink (see definitions section).

The sample potentially included all health care workers who entered the unit during a four-month period. As the identities of participants were not recorded, it was not possible to determine the sample size. A total of 720 hand hygiene observations were made over the study period.

Ethics

Ethics approval for the study was obtained from the relevant Human Research Ethics Committees.

Research Design

Hand hygiene frequency was measured over four one-month periods. The first phase was a baseline phase, and phases 2-4 were intervention phases. The intervention phases included an organizational change phase which included individual written reminders to staff to handwash from organisazational leaders, orientation on HH to

new staff, and HH competencies for staff entering the unit; a patient participation phase in which patients and their relatives were asked to remind health care workers to perform hand hygiene; and a performance feedback phase in which feedback on HH frequency was posted in the unit on a weekly basis. Two methods were used to determine changes to HH frequency:

- An audit of hand hygiene solution used during each of four one-month phases adjusted for patient days. The volume of solution dispensed by each dispenser in the unit was measured. The average volume dispensed was 5 mL. The volume of total solution used (mL) in each one-month period was divided by five to give the number of aliquots used. This figure was then divided by the number of patient days for that period. This method measured HH events per patient day.
- Covert observation of the handwashing compliance of staff by 9 trained data collectors who signed confidentiality agreements to protect the identities of the persons they were observing. The data collectors, who were staff volunteers, recorded the profession of the person they were observing and whether or not they performed hand hygiene in the correct situations. The staff were aware that their handwashing was being observed but were not aware of who the observers were. Data collection occurred across three shifts, and the timing of the observations depended on when someone trained in the procedure was available. Data collectors were not restricted to observing interactions at a particular set of beds. This method measured percentage adherence to HH guidelines. Eighty hours were spent on observing hand hygiene over the study period.

The following definitions were provided:

1. Any action to cleanse the hands using a hand-cleansing agent is defined as handwashing.⁹ The hand hygiene solutions used in the unit during the study period were Microshield T (Triclosan 1.0% w/w) hand hygiene solution, Microshield (methyl hydroxybenzoate and propyl hydroxybenzoate) hand hygiene solution, and Avagard Antiseptic Handrub (Chlorhexidine Gluconate 0.5% w/v 70% v/v ethanol).
2. Any contact by the staff member's hands (whether gloved or ungloved) with the skin, secretions, excretions or blood of a patient, or with an invasive device is considered patient contact. Contact with bed linen, monitoring equipment or medical records is not defined as patient contact.⁹
3. Leaving the area without handwashing is considered a failure to handwash.
4. Once a staff member's hands have made contact with the patient or devices mentioned in point 2, they must wash their hands prior to making contact with other patients, equipment, or surfaces, otherwise they will be recorded as a failure to handwash.
5. Staff must wash hands on entering and leaving the unit, and on entering and leaving an isolation room.

This study assumed that changes to HH frequency due to the interventions implemented would correlate across the two types of measurement. In other words, if an intervention was successful, the amount of HH solution used would increase and the proportion of staff observed performing HH would also increase.

The number of contacts of X-ray technicians with patients in the unit (a known quantity because a request slip is written out for each X-ray carried out) was retrospectively compared with the number of times their HH behaviour was recorded

during the same period to determine what proportion of contacts were observed. This comparison was not possible for other professional groups because there was no way of accurately calculating the number of patient contacts of these groups. Frequency statistics were used to describe the data.

Results

HH frequency by audit of solution use

Hand hygiene frequency doubled in phase 2 and was 50-65% higher in phases 3 and 4 compared to the baseline phase (Figure 1).

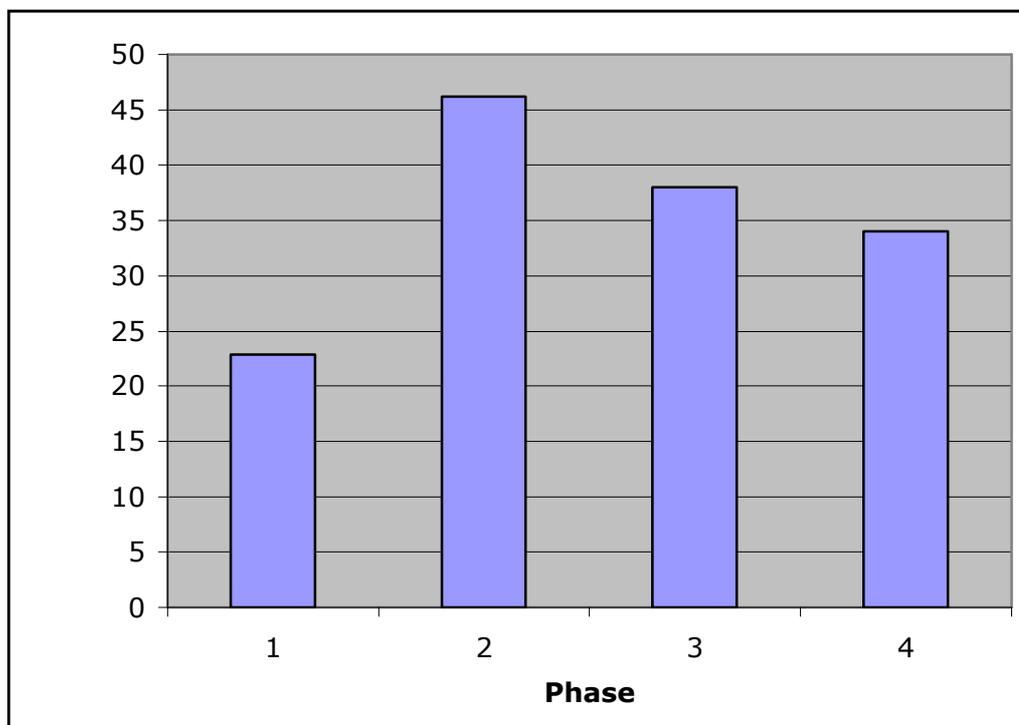


Figure 1. Hand hygiene frequency per patient day over each of four one-month periods. Phase 1= baseline; phase 2 = organization change; phase 3 = patient participation; phase 4 = performance feedback.

Percentage compliance with HH by observation

The percentage adherence of staff to the HH guidelines defined in the methods section fluctuated across the study period (Figure 2).

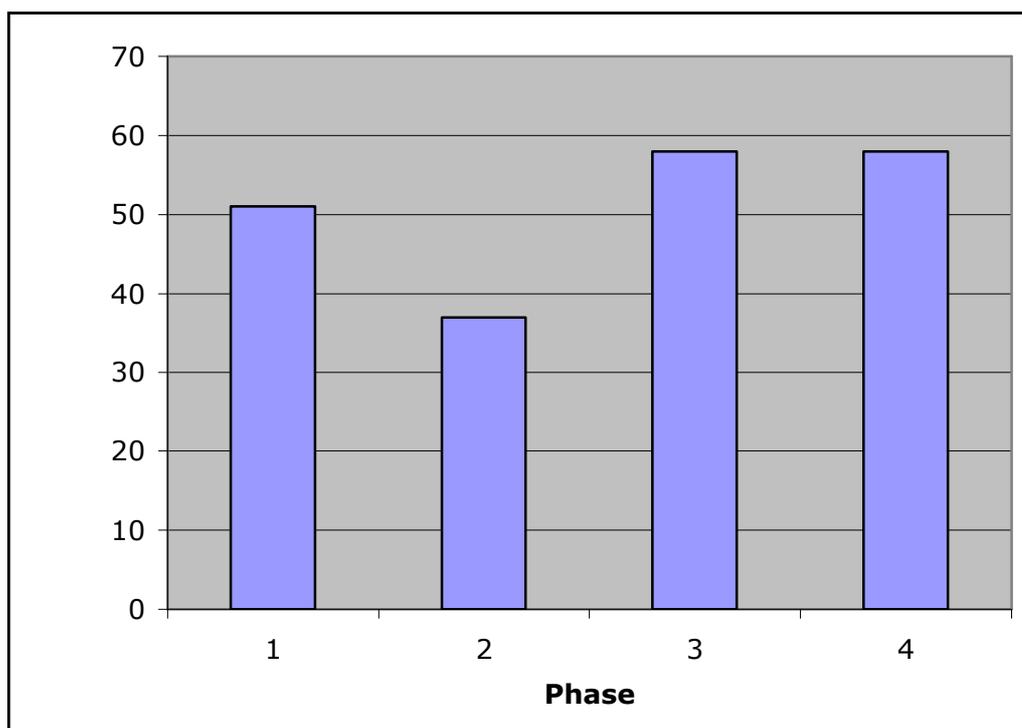


Figure 2. Percentage adherence to hand hygiene (HH) guidelines of staff across four one-month periods. Phase 1= baseline (n=181 observations); phase 2 = organization change (n=98); phase 3 = patient participation (n=83); phase 4 = performance feedback (n=348).

Proportion of x-ray technician contacts observed

The percentage of X-ray technicians' patient contacts observed across the study period ranged from 0-12.5% (Table 1). The average capture rate of X-ray technician contacts with patients across the four phases was 3.4%.

Table 1. The percentage of patient contacts by X-ray technicians across each of four phases.

Phase	No. of patient contacts	No. of contacts observed	Percentage of contacts observed
1	367	0	0%
2	397	8	2%
3	372	2	0.5%
4	320	40	12.5%

Discussion

These results highlight one of the problems of ensuring that sampling by observation is sufficiently rigorous to be representative of the behaviour the study is trying to observe. While the HH solution usage data showed very clearly that HH frequency doubled in phase 2, the observation data showed a marked decline in HH adherence during the same period. Across the four phases of the study we captured on average only 3% of X-ray technicians' patient interactions. This may not be representative of the population.

It is not possible to physically observe all interactions in a 12-bed unit, particularly as many of these occur behind curtains or closed doors to protect patient privacy. An observational study may only sample a small number of the actual interactions, which may provide a distorted or skewed picture of what is happening. For example, the highest number of observations (348) was recorded in phase 4. The literature suggests

that in the acute setting, there may be up to 40-45 occasions for HH per hour per patient.^{24,25} Using a conservative estimate of 10 occasions for HH per hour per patient and multiplying that by the number of patients and the number of hours per day, there should be at least 2880 possible HH occasions per day in this unit, and almost 86,500 in a month. If this is the case only 0.4% of the actual HH occasions were observed in the best month of observation. The possibility of inaccuracy is substantial when sampling such a small proportion of the overall events.

There are additional sources of error with observational studies. If persons of interest are asked for consent prior to observation, then those whose HH is extremely poor may avoid participating in the study, which may bias the results. If overt observation is used then people may change their behaviour when they know they are being observed. For example, Pederson et al²⁶ found that 80% of women washed their hands after using the toilet when there was an observer present, versus 17% who washed their hands when the observer was hidden in a cubicle. Similarly, Drankiewicz and Dundas²⁷ found that college girls were less likely to leave the washroom without washing their hands when they were not alone. Conversely, Gould²⁵ suggests that HH behaviour in health care workers is so entrenched that they will behave as usual even if they know they are being observed.

Is sampling by observation unbiased? For example, if the data collector sees a staff member perform a physical examination of a patient with MRSA in bed one of the unit, and then examine every other patient on the 12-bed ward without washing his/her hands, the data collector may record 12 failures to perform HH that have all been one individual. While the data collector has been transfixed by that behaviour they may have missed multiple other positive interactions.

One way to deal with this is to observe interactions at particular beds and at times specified in advance. In this way, the tendency towards observer bias is reduced, however, there is still the possibility that the data will be skewed by observing the same individual over an extended period. For example, the same nurse will be responsible for the care of a particular patient over an 8-12 hour shift. The data collector might observe a hundred interactions at a particular bed over a shift, most from the same individual. If that individual is not representative of the larger population (i.e., they perform HH more frequently or less frequently than the total population of staff), the results will be skewed.

There are several further issues to be considered when using observation as a method to measure HH frequency. The data collectors need to be provided with clear definitions of what constitutes HH, and it is advisable to ensure that different data collectors interpret HH events in the same way (interrater reliability). Covert observation in particular raises another issue. For example, what does the data collector do if they see someone failing to wash hands in a prescribed situation? Failure to say anything may put the patient at risk, however if the data collector provides a reminder to every health care worker who fails to wash their hands, it may skew the results of the research and the observer would no longer be covert.

Calculating HH frequency via tracking HH solution use avoids the sampling problems of observational studies and the possible selection biases of observers. This method can determine if HH improves or deteriorates following the implementation of HH initiatives. If the researcher has a reasonable estimate of how many HH events there should be per hour per patient, tracking HH solution use gives an idea of how close

health care workers are to meeting the goal and how significant any improvements they have seen following interventions are. For example, if there are normally an average of 20 HH events per hour per patient, and an intervention improves the HH rate from two events per day to four, that may be a statistically significant improvement, but it would be less clinically significant than improving the rate from five to 10 HH events per hour. An additional and important consideration is that solution use auditing is much more time efficient than observation of hand hygiene adherence.

The audit method has its own limitations. Tracking HH solution use doesn't provide information about the characteristics of the persons who are and are not performing HH, or about which particular HH events are being missed, or how well staff are performing HH. In situations where those kinds of data are required then observation is an important tool.

Another issue with measuring HH solution use is that one depression of the plunger on a dispenser bottle of HH solution is characterized as one HH event. Some staff may depress the plunger several times for each HH event, which might inflate the number of HH events per patient day.⁶ However, in this instance, the behaviour should be stable across the different phases of the study and thus it shouldn't introduce bias into the results when comparing a baseline phase to intervention and follow-up phases.⁶

Situations in which observation of HH behaviour can work well include those where there is a way of observing a high proportion of interactions that take place. For example, Pederson²⁷ studied handwashing behaviour in toilets, and was able to

observe every person who used the facilities during a particular time period. Feather et al.¹⁴ were able to observe the behaviour of every medical student performing in a clinical examination at a particular clinical station. Nishimura et al²⁹ used video surveillance to examine whether or not persons entering the ICU environment washed their hands on entry as required. Thus there was no selection bias.

The particular limitation of this study is that the two types of hand hygiene measurement are not directly comparable and thus the results cannot be tested statistically.

Recommendations

Different methods of measuring HH adherence and frequency have different advantages and disadvantages that must be considered when making decisions about methodology. Monitoring of HH product usage may be more accurate as it is less subject to bias and the Hawthorne effect than observations. Additionally, hand hygiene solution audit took considerably less time to complete. If observation is used as a tool to measure HH adherence in order to obtain data that are not available with other measurement tools, the method of applying it should be very carefully planned in order to maximise the sampling of the behaviour, and the limitations of the method should be acknowledged. Further studies should be conducted to determine the best sampling protocol to provide a relatively reliable estimate of HH adherence if the observational method is used.

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