



## Major article

## Observer accuracy and behavior analysis: Data collection procedures on hand hygiene compliance in a neurovascular unit



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### Key Words:

Behavioral science  
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Accurate reporting  
Data collection integrity

**Background:** Although observational studies are popular, little has been done to study the integrity of human observers and the data collection process. Issues of data collection integrity threaten functional findings, leading to problematic interpretation and decreased replication. In our study the response effort associated with hand hygiene data collection in a hospital setting was manipulated using an altered data collection tool.

**Methods:** A counterbalanced ABAB design was implemented across 2 semesters of a hand hygiene data collection practicum course.

**Results:** When response effort increased, compliant audits decreased and when response effort decreased, compliant audits increased. These results were statistically significant, with an overall level change  $z$  that had a  $P$  value of .001 (first semester) and .007 (second semester).

**Conclusion:** These findings may warrant an increased awareness of data collection procedures where recording options include a less effortful response. The results of our study support basic research on response effort and choice behavior in an applied setting, bringing into question the integrity of data collection procedures and the integrity of the data collected. These results also suggest the need for standardizing reporting systems to ensure hand hygiene collection and reporting procedures are comparable across settings.

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Isolating hand hygiene as a causal variable for hospital-acquired infections (HAIs) was demonstrated in the late 1840s when Ignaz Semmelweis was able to garner empirical support for the concept of attributing the transmission of puerperal fever to the unclean hands of health care workers (HCWs).<sup>1</sup> Hand hygiene was, and still is, the most important practice for preventing the transmission of HAIs. However, despite all we have learned through research and technological contributions since transfer of disease was first postulated, hand hygiene compliance still remains a problem.

During 2002, an estimated 1.7 million patients in the United States acquired an HAI and, of those, an estimated 99,000 patients died as a result of the infections. This situates HAIs as the fifth leading cause of death in US acute care hospitals.<sup>2</sup> Research validates that HAIs decrease as compliance to hand hygiene protocol

increases.<sup>3</sup> Research further suggests infection rates can be decreased by 33% with compliance to hand hygiene protocols.<sup>4</sup> Although hospitals have long had policies requiring HCWs to conduct hand hygiene between patients, reported compliance rarely exceeds 50%.<sup>5</sup>

### HAND HYGIENE PROGRAMS

Most hospitals are now implementing programs to measure and improve hand hygiene compliance. In addition to the social significance of increased quality of care and safety to patients and HCWs, reducing HAIs decreases financial loss for organizations. During 2007 additional treatments and longer hospital stays resulting from HAIs were responsible for an estimated \$35.7 billion to \$45 billion in extra health care costs.<sup>6</sup> As of October 2008, the Centers for Medicare and Medicaid Services enacted a revision to payment systems that excludes coverage of HAIs. The revised system further prevents health care organizations from passing additional cost of HAIs to patients.<sup>7</sup> Many private insurers

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are following suit, leaving the burden of cost to health care organizations.<sup>8</sup>

Unfortunately, most interventions on hand hygiene compliance have short-lived success. To be effective, a program must become part of a permanent practice. Furthermore, to obtain long- or short-term success, the program must have administrative support. Providing a bolster of administrative support aids the intervention program by ensuring that change will take effect via consequential action. The naturally occurring consequences for engaging in hand hygiene within a hospital are often punishing and ineffective. To follow suggested protocol, staff must use hand hygiene measures frequently. To do so requires response effort, interruptions in routine, and time away from patients or other tasks. In addition, frequent hand hygiene increases dry and chapped hands, which is physically aversive. These consequences are immediate and punishing. Escape from negative covert verbal behaviors surrounding perceptions of infection and personal hygiene (eg, the worker “feels” dirty) may provide some reinforcement, but the probability of microbial transmission is often perceived as unlikely.<sup>9</sup> That is, they may engage in hand hygiene to “feel clean” if a patient encounter made them “feel dirty.” Furthermore, unlike a medication error, it is unlikely that the consequence of patient harm from contaminated hands will be connected back to the HCW responsible. Without this feedback, crucial negative covert verbal behaviors (eg, “I am harming my patient by not washing my hands”) are unlikely to occur. Additionally, the existing environmental contingencies from the organization—social approval or disapproval—are not probable or valuable enough to control the behavior. To evoke change, organization-wide consequences need to be established that will support hand hygiene behaviors. To ensure that they are enacted, high levels of administrative support must be employed.

Another problem with current hand hygiene programs is the lack of uniformity in the dissemination of results due to varied data collection procedures and methodology. Operational definitions of what does and does not constitute a hand hygiene opportunity differ, as do the data collection methods. In addition to varied methods and criteria used, reported research does not convey specifics of their components.<sup>3</sup> This may contribute to difficulties with operational definitions and discernment of auditing opportunities.

Direct observation of hand hygiene behavior allows us to see hand hygiene behavior as it is occurring.<sup>10</sup> Despite this benefit, there are drawbacks to direct observation, including resource allocation requirements, a lack of universal standardization of the auditing process, reactivity, differences in training and experience of the observers, and differing operational definitions between organizations. Research on the use of human observers cautions researchers to ensure the observers are conducting accurate observations. Factors such as reactivity, observer drift, the recording procedure, reliability, complexity and demands of the task, subject, and setting may all compromise the data collection practice.<sup>11</sup> Furthermore, using preexisting staff to audit the hand hygiene behavior of other employees introduces the potential for biased data. Falsification of data may result from negative treatment by peers, pressure from the organization to do well, and/or punishing consequences that may fall on a particular department or the organization as a whole for results that do not meet a set goal. Falsification and/or withholding data prevents an accurate representation of an organization’s hand hygiene behavior and fails to identify areas that need improvement, although adding inter-rater reliability procedures can help to reduce this to some extent. This said, studies have demonstrated that direct peer observation can be effective in reducing accidents, even if data are not always perfectly reliable.<sup>12</sup> However, accurate data is essential for the integrity of research findings and it is certainly essential with regard to disease

surveillance and hand hygiene. Accurate data collection lends awareness to problem areas that may, in turn, lead to optimization of processes that improve hand hygiene. Additionally, when dealing with human observers and error, tight control in data collection and methodology is essential for accurate representation of compliance. Inconsistent and inaccurate measurement of adherence results in reports that are questionable, making comparisons of organizational compliance between institutions difficult.

Little research has been conducted on the integrity of human observers and the data collection process, aside from employing inter-rater reliability (IRR) procedures. Energy is typically focused on treatment integrity by making sure the intervention was implemented as planned. Even then, the assessment of treatment integrity has been relatively low.<sup>13</sup> Antecedent tools in the form of instruction and standard operating procedures (SOPs) get desired adherence started, but consequences are necessary for maintenance. Although there may be set expectations and clear operating procedures in place for both the auditors and the employees being audited, behavioral research confirms that what really controls behaviors are the consequences in place. When there is a lack of consequence for employees engaging in hand hygiene and also for auditors documenting the behavior, or if the natural consequences support the wrong behavior, you will get undesired behavior that SOPs cannot fix. Integrity of both the independent and dependent variables is essential and incomplete analysis of their respective integrity threatens functional findings, leading to problematic interpretation and decreased replication.

In the science of human behavior—behavior analysis—response effort refers to the amount of effort required to complete a task. That is, how much effort is needed to accomplish a particular behavior. As response effort increases and a task becomes increasingly difficult, there will be an effect on an individual’s behavior. Basic experimental research has shown that if an organism is presented with 2 choices that have the same outcome, but with differing response efforts, the organism will allocate more time to the less effortful response.<sup>14</sup> That is, when given an easy response versus a harder response, the organism will choose the easier response. Research further demonstrates that response rates decrease as response effort increases.<sup>15</sup> There is little applied human research investigating the effects of response effort on responding when given a choice between 2 responses.

Differing response efforts in data collection is not uncommon. For example, when collecting data on the occurrence of a behavior, negative or positive, there is response effort for collecting data on the target behavior—but little or no response effort for collecting data on the absence of the behavior. The occurrence of the behavior may require the observer to record times, dates, settings, antecedents, and consequences. These constitute higher response effort because they require additional time and attention on the part of the auditor. Further, the collection of longitudinal data may be subject to increased fatigue and lax practices by the observer. To promote optimal data collection, response dimensions, specifically response effort, should be equal across all levels of responding. Because experimental data have shown that organisms prefer low effort responses, equalizing effort should prompt auditors to choose the correct response, instead of the easiest. When response effort differs between 2 choices, every effort should be made to decrease the response effort associated with the more difficult task.<sup>16</sup> However, this is not always possible.

#### *Our study*

Although SOPs were in place for hand hygiene and the data collection process, the high percentage of reported compliance was concerning when compared with national averages. The

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