

Evaluating the Accuracy of RFID Technology to Measure Hand Hygiene Compliance

Marlon Benjamin, MS; Samuel Schuessler, MHA; Amanat Sidhu, BA; Dept. of Epidemiology & Infection Control; Karen D'Souza, RN, MHA, Laura Winner, RN, MBA, Armstrong Institute for Patient Safety and Quality



1 Background

We have known about the importance of hand hygiene for preventing the spread of infection since the work of Semmelweis (Cork, Maxwell, & Pinckney, 2011). The World Health Organization (WHO, 2009) has cited consistent and proper hand hygiene practices as the single most effective way to prevent hospital acquired infections (HAI). Studies show that hand hygiene compliance rates rarely exceed 50% (Sahud, Bhanot, Narasimhan & Malka, 2012). It is estimated that over 1.7M patients are harmed and as many as 90,155 die annually from a HAI (Scott, 2009; Blouin 2010). The WHO observer based method (WHO, 2009) for measuring hand hygiene compliance is currently considered the gold standard. Limitations of this method include: expense, observer bias and obstructed views, and measures only a small sample of actual occurrences. The development of radio frequency identification (RFID) technology for measuring hand hygiene compliance moments holds promise to improve upon the observer method. With this in mind, a vendor supplied RFID system was selected and tested to evaluate how accurately it measure room entry and exit hand hygiene compliance.

2 Methods

Working in conjunction with the Johns Hopkins Hospital Epidemiology and Infection Control (JHHEIC) compliance parameters for entry and exit hand hygiene were determined. These were programmed into the RFID test system which was installed in the Johns Hopkins Medicine Simulation Center. Testers were trained on vendor identified RFID badge best practices that optimize data capture as well as three non-conforming hand hygiene behaviors typical in the clinical settings. Testing scenarios were as follows:

1. Badge Best Practice Pocket. A unique user badge is worn on a clip attached to the nursing uniform pocket. The alcohol dispenser is approached directly head-on with the tester's arm outstretched in front at a distance of 2-3 feet when the alcohol dispenser used.

2 Methods Cont'd

- 2. Badge Best Practices Lanyard.** A variation on scenario 1, wherein the user badge is worn on a lanyard cord suspended from the neck.
- 3. The user Standing Sideways to Dispenser.** This is a typical clinical setting behavior.
- 4. Walking Quickly Past.** This also a typical clinical setting behavior.
- 5. Two Testers Side-by-Side.** Testers 1 and 2 perform hand hygiene in close sequence.

3 Results

A total of 500 tests of room entry and room exit hand hygiene opportunities, 100 for each of the five scenarios, were performed. Testing was randomized across all scenarios with 4 testers working in pairs. Results are shown in Figure 1 below. When testers followed badge best practices, the RFID system accurately captured entry compliance over 90% of the time. Accuracy of measurement of entry hand hygiene compliance that was performed not following badge best practices degraded to below 80% accuracy. Exit compliance accuracy measure in all scenarios (even with badge best practices) were less than 90%. Further degradation of accuracy was seen with testing of scenarios such as approaching the dispenser from the side and walking quickly past the dispenser which occur frequently in the clinical environment.

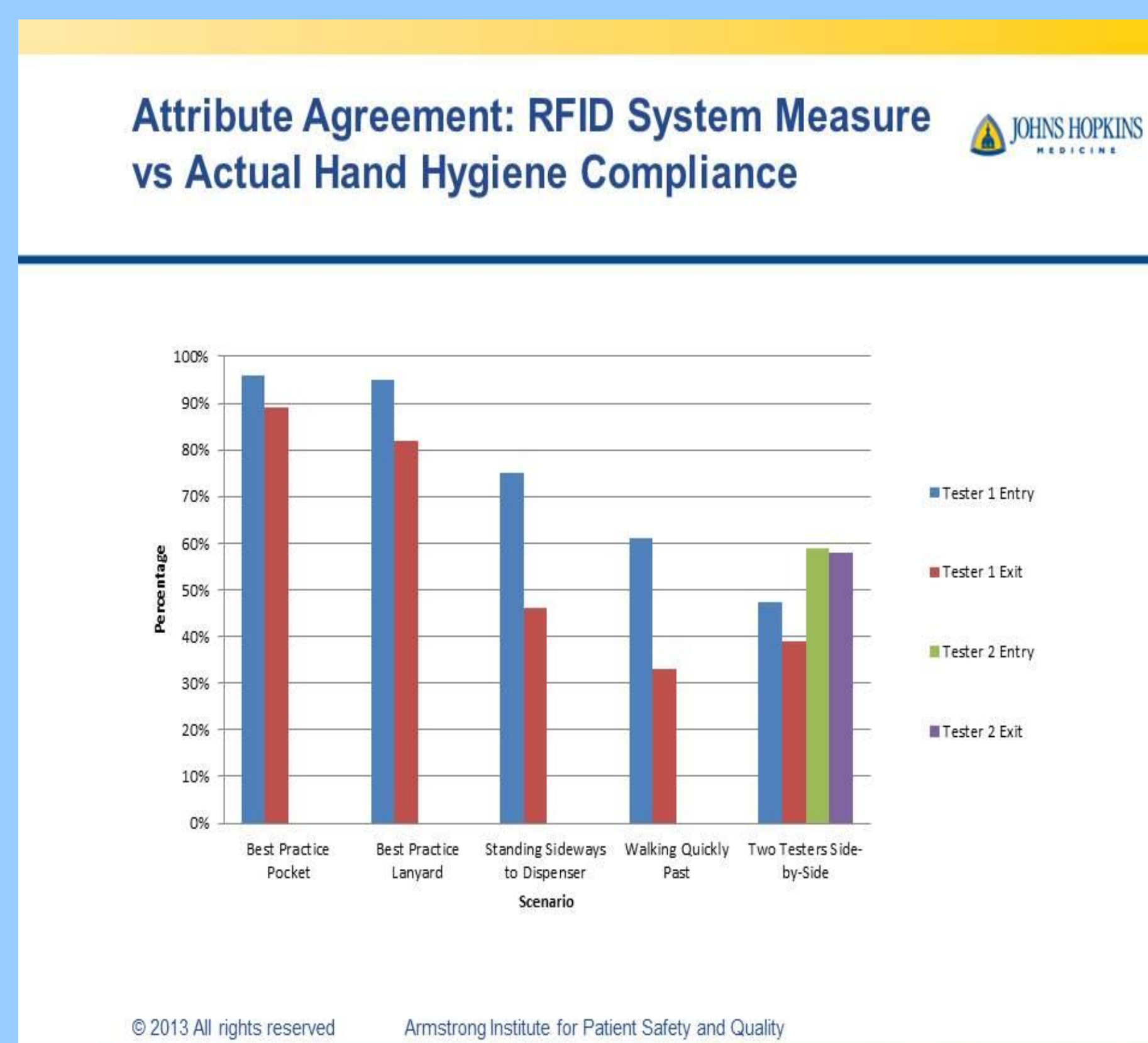


FIGURE 1. Bar graph showing the % agreement between RFID recorded hand hygiene compliance and actual hand hygiene compliance for entry and exit across various testing scenarios.

4 Conclusions

Simulation testing of the vendor supplied RFID system demonstrated that it has the capability to accurately record entry hand hygiene compliance more than 90% of the time when badge best practices are followed. This is encouraging and needs to be explored in a clinical setting where deviations from badge best practices present challenges. The potential to use this technology to accurately measure hand hygiene compliance and provide near real time feedback requires further study.

5 Future Directions

To further our understanding of the potential RFID technology holds for accurately measuring hand hygiene compliance, testing in a clinical environment is a crucial next step. Only then might we be able to also assess the receptiveness of clinicians to this technology. The near real time feedback capability of RFID hand hygiene compliance technology offers an opportunity to facilitate a new level of self-awareness of individual hand hygiene compliance and perhaps promote behavior modification to achieve higher levels of hand hygiene compliance and reduce the risk of HAIs.

6 References

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