

Hand Hygiene Technology: A Brief Review of the State of the Art of Microbial Control in the Hospital Setting

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The continuous improvement of hand sanitization efficacy remains a vital practice for medical personnel. This is especially relevant in hospital settings, where recent studies have shown that only 5%–40% of healthcare workers adhere to recommended hand washing guidelines at work (1). In response to the constant challenge of containing community acquired and nosocomial infections, an interesting mix of creativity and innovation has provided significant results in diverse locations.

What to use? Alcohol-based hand rub, with more than 70% w/v, is recognized as the gold standard for hand hygiene of non-soiled hands (2). The World Health Organization recommends using alcohol hand rub following the same seven-step technique as for hand washing with antimicrobial soap and water (3), whereas the Centers for Disease Control and Prevention recommends applying alcohol to cover all surfaces of both hands and fingers until the hands are dry. The latter is quicker, and provides equal antimicrobial outcomes (4).

But, let us keep hands healthy! In an American study, a damaged skin barrier had a higher microbial count, with alarming increases in bacterial colonization among hospital workers (5). That study also noted that self-reported irritant contact dermatitis was more likely in healthcare workers using soap and water than those using alcohol-based sanitizer, a tribute to the advancement of skin protection technology integrated into currently available sanitizers.

Among the interesting mix of patient protection technologies around today is a hand sanitizer-dispensing door handle, which nebulizes alcohol-based cleanser onto hands each time the door handle is used to open the door. The agent-dispensing lever replaced the door handle, making contact with cleaning solution compulsory to access the room. The user was then required to rub in the agent according to protocol, to complete proper hand cleansing. There was up to 75% improvement in hand sanitization, during the intervention phase (7).

Moving up the technology ladder is a Real-Time Feedback ID (RFID) card system, installed at a hospital ICU in India (8). Passive RFID tags were issued to

the doctors, nurses and support staff of the ICU. Long range RFID readers were positioned strategically around patient beds. Sensors were placed beneath the hand sanitizers to record sanitizer usage. The system would alert the staff by flashing a light if an opportune moment for hand sanitization was detected. A significant increase in hand sanitizer use was noted in the intervention arm of the study. Interestingly, hand sanitizer usage was highest during the early part of the workday and decreased as the day progressed. Also, hand wash events per person-hour were highest among the ancillary staff followed by the doctors and nurses. Such a system is quite elaborate, and appropriately so, but simpler systems also provide meaningful results.

What makes us wash our hands more frequently? Hospital administrators report that the lowest cost, most effective method of increasing hand washing frequency is direct observation of healthcare workers. Electronic and video surveillance provide significant increases in hand cleansing acts, with lower manpower input than the most effective option: direct observation by patient safety teams (9). The latter have the opportunity to systematically, and in real time, address specific areas for improvement by staff. The digital recordings, however, provide evidence of hand washing frequency and technique, which has been used in subsequent training and evaluations, but incur increased costs for long-term maintenance. The Hawthorne effect ('I do it because I am being watched') is a risk of any surveillance system, but the improvement in infection control has been repeatedly reported (9). Some hospitals employed infection control systems that measured product volume in an effort to encourage hand cleaner use, but this is the least desirable method, as it does not capture flaws in hand wash technique (8).

In the final analysis, each hospital has specific, multifactorial challenges to hand cleaning by staff, and hospital-specific answers should be actively and continually pursued (9). The infectious disease monster, even in our setting of limited resources, is a defeatable foe.

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