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MediHandTrace®: a tool for measuring and understanding hand hygiene adherence

S. Boudjema[1,2], J. C. Dufour[3,4], A. S. Aladro[2], I. Desquerres[2] and P. Brouqui[1,2]

1) *Aix Marseille University, URMITE, UM63, CNRS 7278, IRD 198, Inserm 1095,* 2) *Infectious Disease Unit CHU Nord, Institut Hospitalo-Universitaire Méditerranée Infection,* 3) *Aix Marseille University, UMR912 SESSTIM (AMU-Inserm-IRD-AMSE), 13005, Marseille, France and* 4) *Assistance Publique des Hôpitaux de Marseille, BIOSTIC, Pôle de Santé Publique, 13005, Marseille, France*

Abstract

The proper implementation of hand hygiene at key moments during patient care is the most important means of preventing healthcare-associated infection. Although there are many programmes aimed at enhancing hand hygiene, the compliance of healthcare workers (HCWs) remains incredibly low. One limiting factor is the lack of standardized measures and reports of hand hygiene opportunities. Direct observational audits have reported the weaknesses in this field. We report here a radiofrequency identification-based real-time automated continuous recording system (MediHandTrace®) that permits the tracking of hand hygiene opportunities and the disinfection compliance of HCWs that we evaluated against video recordings as being accurate (99.02%), sensitive (95.65%) and specific (100%). The system can also provide information that is useful to understand HCW non-compliance and will allow the evaluation of future intervention studies.

Keywords: Compliance, hand hygiene, healthcare workers, hospital-acquired infection, monitoring, new technology, radiofrequency identification

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Corresponding author: P. Brouqui, URMITE, Faculté de médecine, 27 bvd Jean MOULIN, 13005 Marseille, France **E-mail**: **philippe.brouqui@univ-amu.fr**

Introduction

Hand hygiene is a core element of patient safety for the prevention of healthcare-associated infections. Alcohol-based hand rubs have become a gold standard of care for practicing hand hygiene in healthcare settings. The observed compliance rates among healthcare workers (HCWs) have been regarded by public health authorities as unacceptably poor. In a recently published systematic review of 96 studies, the unadjusted compliance rates were 30–40% in intensive care units and never surpassed 60% in other settings. Interestingly, the compliance rate was lower among physicians (32%) than among nurses (48%) and before (21%) than after (47%) patient contact [1] . In this context, measuring healthcare worker hand hygiene has become a challenge. Several methods for monitoring hand hygiene have been proposed; among them is the direct observational survey of 'my five moments' that has become the gold standard recommended by the WHO [2]. However, direct observational surveys suffer from several limitations. They are time-consuming and costly; they do not allow continuous monitoring; and they only provide information about a very low percentage of all hand hygiene opportunities. Moreover, direct observation of HCWs may affect their behaviour. Some authors have stated that, compared with product usage and electronic counting devices, direct observation should not continue to be considered the gold standard [3]. Because product consumption requires fewer resources relative to observational surveys, it is one of the most frequently used methods to evaluate hand hygiene; however, the study results vary depending on the correlation between product consumption and the observed compliance rates, indicating that electronic counting devices are more accurate [4]. New technologies are currently being developed to monitor hand hygiene [3]. Electronic monitoring systems, such as dedicated

hand hygiene monitoring systems [5], real-time locating systems [6] and video monitoring of hand hygiene [7], appear promising. More accurate than the first two methods, they allow real-time and continuous follow up of hand hygiene opportunities [8,9]. However, most devices are unable to distinguish among the staff members and visitors who enter or exit the room of the patient and which of the 'five moments' to consider [8]. Although new technologies allow for the collection of a complete set of data for hand hygiene improvement, the current understanding of the non-adherence to hand washing is poor. The lack of compliance to hand hygiene is likely to be multifaceted and is assumed to be attributable to various factors, such as HCW behaviour, bedroom design, alcohol dispenser location, patient co-morbidity, HCW workload, and day and week period, all of which merit further study. In this paper, we performed a pilot evaluation of the accuracy of a new patented radiofrequency identification (RFID)/location-based device coupled with an alcohol dispenser sensor (MediHandTrace®) and compared its results with a video recording of hand hygiene practice in an infectious disease ward to assess the capacity of the device.

Materials and Methods

This study was conducted from November 2012 to April 2013 in two equipped rooms of a 17-bed infectious disease ward in France.

Materials

The system is based on the 'iCode RFID 15693' tag technology (ex NXP) using the frequency band of 13.56 MHz. Each room was equipped with four floor-level antennas used to read tags inserted in the shoes of each HCW (Figs 1 and 2). One antenna was located just outside the room door under the alcohol dispenser [10], the second antenna was located at the door entrance, the third was within the room under another alcohol dispenser, and the last antenna was located around the bed and defined a secure zone (i.e. the zone for which alcohol disinfection should have been performed before entering). Sensors were placed on both alcohol dispensers, measuring the use of hydro-alcoholic solution inside and outside the room by indicating the number of sprays and the volume dispensed. One reader coordinates the antennas to read the HCWs' shoe-inserted tags, and the dispenser sensors and transfers the information to the main server via an Ethernet connection. The intelligence of the system lies in the server, which manages, interprets and provides results in real time. The contact delay between the tag and the antenna can be addressed by adjusting the sensitivity and specificity. During stage 0 and stage 1, they were set up at 5 s, then reduced to 4 s and finally 3 s. It is important to note that only one antenna is active at a given point in time, although the extremely short reading time makes the antennas alternate almost simultaneously. During stages 0 and 1, only one antenna was installed near the bed (at the side in front of the door), and during stage

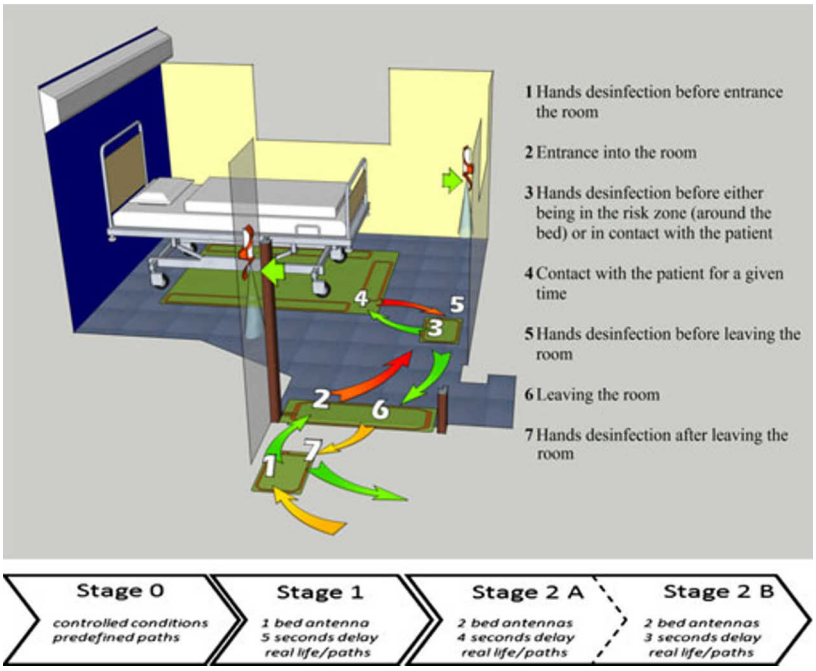

FIG. 1. Room's antennas and steps in healthcare worker paths as in stage 2 analysis. In stage 1, the antenna on the window side was not placed.