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Wearing gloves: the worst enemy of hand hygiene?

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“While numerous studies have been undertaken to improve our understanding of the determinants of hand hygiene behavior, it seems urgent to improve our understanding of the determinants of glove usage behavior as well.”

Although healthcare worker (HCW) compliance with hand hygiene guidelines is considered the cornerstone of preventing pathogen cross-transmission, the overall proportion of adherence remains low, usually below 50% in most hospitals [1].

Although a multimodal program designed to improve HCW adherence to hand hygiene has been shown to be effective [2], a sustained improvement of practice over time has been often difficult to obtain [3]. Other important efforts have been undertaken to increase hand hygiene compliance, particularly by improving our understanding of the determinants of hand hygiene behavior [4]. Some more coercive measures including violation letters and progressive disciplinary action for repeat offenders have also been proposed to act as an incentive for increased adherence [5].

Hand hygiene and glove wearing are closely related practices in the clinical setting. Therefore, the usage of nonsterile disposable gloves must also be considered when investigating the reasons of poor compliance with hand hygiene and trying to improve it. According to standard precautions, gloves must be worn for contacts potentially exposed to body fluids in order to ensure the safety of HCWs. In addition, it is also recognized that gloves can be highly protective with respect to hand contamination [6]. The potential impact of this protective effect is particularly interesting for contact with multiresistant bacteria carriers or their environment [6]. However, wearing gloves is not completely free of risk in terms of microorganism cross-transmission.

The frequent contamination of gloves after contact with patients and the risk of microorganism transmission in the absence of glove removal have been well established. In a study conducted in three intensive care units and two medical

wards, Girou *et al.* demonstrated that failure to change or remove contaminated gloves was a major component in the poor compliance with hand hygiene [7]. In a more recent study, it has been shown that 36.2% of interactions between HCWs and patients colonized with multidrug-resistant *Acinetobacter baumannii* resulted in a contamination of the gloves worn by HCWs by the pathogen during these interactions [8]. It is also noticeable that 4.5% of these interactions resulted in contamination of HCW hands after glove removal. In another report, methicillin-resistant *Staphylococcus aureus* (MRSA) was isolated from HCW hands before washing in 13% of the cases in which HCWs had worn gloves during contact with an MRSA carrier [9].

“Hand hygiene and glove wearing are closely related practices in the clinical setting.”

Therefore, several practices must occur around glove usage: hand hygiene before gloving, glove removal after each contact with the patient or environment and hand hygiene after glove removal. It must be admitted that poor practices are often recorded around glove usage. In a study conducted in a Turkish hospital, compliance with hand hygiene before gloving was 3% in physicians and 14% in non-physicians [10]. The major risk associated with this lack of compliance is the contamination of glove boxes, making them an environmental reservoir of pathogens. The HCW behavior following a contact with gloves worn (i.e., glove removal and hand hygiene) is of major importance for the risk of microorganism cross-transmission. In a hemodialysis unit, a low compliance with hand hygiene (37%) and a lack of glove removal (performed in only 33% of cases) immediately after patient care have been

Keywords

- glove removal ■ hand hygiene compliance
- infection control
- multiresistant bacteria
- standard precautions
- universal gloving

reported [11]. Concurrently, the failure to change gloves between procedures on the same patient has been identified as a major problem in three hospitals in Hong Kong [12].

Considering the risks generated by glove usage, another point of major interest is the extent of the indications for this practice. Certain authors consider that systematically donning gloves when caring for a multiresistant bacteria carrier can be questioned [7]. The recent national French recommendations regarding the prevention of resistant pathogen cross-transmission (excluding *Clostridium difficile*, vancomycin-resistant Enterococci and carbapenem-resistant Enterobacteriaceae, for which specific recommendations had been previously implemented) specify that glove usage should be limited to contacts presenting a potential risk of exposure to body fluids [13]. Nevertheless, these restrictions of gloving indications are poorly followed by HCWs. In a study conducted in eight health-care settings for elderly people in western France, only 64.4% of contacts in which gloves had been worn were potentially exposed to body fluids [14]. A wide usage of gloves was also reported in other studies. For instance, in a Turkish university hospital, 35% of HCWs systematically wore gloves, whatever the kind of contact occurring with patients [15].

“Considering the risks generated by glove usage, another point of major interest is the extent of the indications for this practice.”

Two recent studies conducted in French healthcare settings where glove usage is considered appropriate for contacts potentially exposing to body fluids and otherwise inappropriate, showed a close relationship between the appropriateness of glove usage and the adherence to practices following the contacts with gloves worn [16,17]. First, in four intensive care units located in a teaching hospital, an appropriate glove usage was reported as a factor significantly and independently associated with the compliance for glove removal immediately after contacts [16]. In addition, according to data recorded from an evaluation of practices conducted in 11 settings for the elderly, a significant negative correlation was identified between the proportion of glove usage in the absence of risk of exposure to body fluids and the compliance with hand hygiene [17]. Concurrently, it is noticeable that a significant positive correlation was identified between

the overall proportion of contacts with glove using (with or without risk of exposure to body fluids) and the compliance with hand hygiene in the same study, showing that these practices are not contradictory [17]. Those results tend to demonstrate that glove usage should be limited to the indications corresponding to standard precautions.

“...most critical point in the interactions between glove usage and hand hygiene is probably the compliance with glove removal...”

Recently, efforts have been made to incorporate additional components in gloves in order to facilitate and secure their usage and to extend their indications. Two objectives were followed: improving the skin tolerance to increase the hand hygiene compliance and adding antiseptic agents to prevent glove contamination by micro-organisms. The implementation of a strategy of universal gloving with emollient-impregnated gloves instead of contact precautions has been associated with improved hand hygiene compliance and skin health, while no statistically significant change in the rates of device-associated infections, *C. difficile* infections or acquisition of multidrug-resistant bacteria was observed [18]. Concurrently, gloves impregnated with an antiseptic dye showed a higher efficiency in preventing contamination of resistant pathogens on the outer membrane of gloves [19]. However, it seems difficult to generalize the results of this *in vitro* laboratory-based study to an *in vivo* clinical setting. In addition, the presence of an antiseptic agent in the gloves could encourage HCWs to wear them for prolonged periods of time with a false sense of security. Arguing from their results, Bearman *et al.* considered that universal gloving could be an alternative to contact precautions for controlling the spread of multidrug-resistant organisms [18]. However, the frequent misuse of gloves and its consequences on the lack of hand hygiene compliance and then on the occurrence of microbial transmission should lead us to carefully consider the impact of those new gloves in terms of effectiveness and safety in infection control. Moreover, a wide usage of these innovations could generate important extra costs that should be evaluated.

While numerous studies have been undertaken to improve our understanding of the determinants of hand hygiene behavior, it seems urgent

to improve our understanding of the determinants of glove usage behavior as well. One important reason for an excessive glove usage has already been identified, as some HCWs admitted to feeling safe while wearing gloves for prolonged periods of time, particularly in situations that they considered to be physically or 'emotionally' dirty [3].

Finally, the most critical point in the interactions between glove usage and hand hygiene is probably the compliance with glove removal immediately after each contact with patients or environment. Therefore, an important question is to determine if a high compliance

is an achievable goal or not. If it is not, glove usage should be restricted to contacts that are potentially exposing to body fluids.

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