EDITORIAL

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Quick and dirty: improper glove use increases infection risk and has global consequences



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Abstract

The development of disposable gloves and the discovery that good hand hygiene are essential for protecting patients are among the most important developments in the history of infection prevention and control, and are both essential for protecting patients and healthcare workers. Although there are international-level guidelines for glove use and hand hygiene during patient care, there are major issues concerning compliance. The overuse of gloving does not only contribute to reduced patient safety and increased healthcare-associated infections, but leads directly to environmental degradation and labor rights abuses.

Keywords Infection prevention and control, Hand hygiene, Sustainability, Labor abuses

Introduction

The World Health Organization (WHO) World Hand Hygiene Day 2025 is focused on the proper use of disposable gloves during patient care [1, 2]. The development of disposable gloves and the discovery that good hand hygiene is essential for lowering rates of healthcare-associated infections (HAIs) are among the most important developments in the history of infection prevention and control, and are both essential for protecting patients and healthcare workers (HCWs) [3, 4].

Although there are international-level guidelines for glove use and hand hygiene during patient care, there are major issues concerning proper use and compliance. While appropriate gloving increases the safety of both patients and HCWs, inappropriate gloving and

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their overuse has led to a patient safety crisis of global proportions.

Not only does improper gloving contribute to reduced patient safety and increased HAIs [2], but their overuse leads to environmental degradation and supports labor rights abuses. This is due to the intrinsic nature of the plastics used in their construction, how and where gloves are manufactured, how they are distributed globally, and how they are discarded. In England alone, an average of over 500 million gloves were sent for use in the National Health Service and social care per month in 2023, which translates to 16.7 million gloves per day [5]. Although gloves are essential to modern medicine, their misuse and overuse mean that gloving often does more harm than good.

Issues in patient safety

Both the WHO and Centers for Disease Control and Prevention maintain that gloves must be changed whenever there is a clinical indication for hand hygiene [6, 7]. Clinical indications include any of the WHO 5 Moments for Hand Hygiene [8], including before patient contact, before aseptic procedure, after exposure or potential exposure to body fluids (including when a HCW is

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moving from a dirty body site to a clean one), and after finishing touching a patient or their environment. This does not mean that gloves should be used for all of the five moments at all times.

Historically, pandemics have caused HCWs to use gloves inappropriately out of fear to protect themselves, from the "universal precautions" during the AIDS pandemic [9] to the constant gloving many healthcare professionals observed during the COVID-19 pandemic. During routine care, unless a patient is highly vulnerable or highly infectious and needs additional precautions (i.e. content precaution, droplet precaution, etc.), non-sterile glove use should be limited to scenarios where a HCW has contact with patient mucosa, might be exposed to bodily fluids, when there is a risk of exposure to cytotoxic drugs, or in the case that the patient or HCW's skin is not intact. This includes any invasive procedures, and the handling of contaminated equipment or sharps [10].

If gloves are not used properly, they can easily become vectors for the transmission of microorganisms to patients. Recent studies have shown that gloves are often misused, putting patients at an increased risk [11–14]. It is well known that a high percentage of the missed opportunities for hand hygiene occur when a HCW is wearing gloves [15–18]. One recent study showed that gloves were only changed in less than 1/3 of the indications for hand hygiene [13]. Although a few older studies in the literature found that increased glove use increases hand hygiene [19–21], these papers are no longer relevant as they were written before the advent of modern hand hygiene monitoring, which was widely adopted after the 2009 publication of the WHO guidelines on hand hygiene [22].

Knowledge gaps and misconceptions

To IPC professionals, the issues around glove use are glaringly obvious. But to other HCWs, many knowledge gaps and misconceptions remain. Some are related to education and training: HCWs may not realize that they have to perform hand hygiene before donning or after doffing gloves, and are often not aware of when they must change their gloves. Appropriate gloving during patient care is challenging, because it requires instant conscious recall of who is being protected at that moment and from what, and why gloves are required in addition to hand hygiene. Because hand hygiene is something that people in community settings do all the time, the level of training necessary to teach HCWs is underestimated, and often neglected. A study of public hygiene behavior during COVID showed that people had good recall of key moments for hand hygiene but faced with real life situations, they still lacked understanding of when or when not to wash their hands because they were unable to comprehend how handwashing works to break the chain of infection [23]. It is crucial for all HCW to have a deep and integrated understanding of the dynamics of transmission in order for them to practice proper hand hygiene.

Glove use can also have an impact on the psychology of HCWs. Numerous studies have shown that HCWs are not aware that gloves are not an absolute barrier for bacteria [13]. This misconception can give care staff a false sense of security [24], making them less aware of the surfaces, objects or patients they touch. This can often cause them to miss hand hygiene actions, possibly also because it is cumbersome to remove gloves, perform hand hygiene, and then wear a new pair.

Patient perception can also play a role. HCWs know that patients may feel more comfortable if they are wearing gloves, and wear them for the perceived benefit of the patient, even in the absence of any clinical indication [25, 26]. A recent UK poll suggested that 30% of people think COVID-19 can be caused by virus penetrating the skin [23].

One study showed that 15% of HCWs believe that gloves are necessary to make a clean bed; 18% think that gloves are required to transfer a patient without transmissible infectious disease, and 50% don't take the gloves off before touching curtains [27]. Multiple studies showed a clear contrast between the personal perception of gloves usage and their colleagues' perception [27, 28]. One study showed that observed hand hygiene compliance rates before gloving were 42%, yet during interviews most HCWs reported 100% compliance [28]. In another, 79% of HCW believed that they used gloves appropriately, but that 88% believed that their colleagues were often not doing so [27]. The apparent knowledge gap also affects HCW confidence in their work: only 56% of study participants felt comfortable speaking to other HCWs regarding their incorrect use of gloves [27].

Issues in environmental degradation and labor abuse

Excess use of gloves causes other harms. The carbon footprint of a glove is estimated at 26 g of carbon dioxide equivalents (CO^2e). For the gloves bought in the first six months of the COVID-19 pandemic in England, this amounted to over 48 million kg of CO^2e ; equivalent to around 8000 people's total carbon footprint in England for the same period [29].

In addition, the majority of gloves are from Malaysia, where there is endemic abuse of migrant workers in glove manufacturing locations [30]. Labor abuses include debt bondage from illegal recruitment fees, retention of identity documents, excessive working hours, and poor worker accommodation. The issues were of sufficient severity that the USA temporarily banned gloves imported from six companies [30].



Fig. 1 The animation below was developed as a tool to highlight the issues with the misuse and overuse of gloves. It was the result of a collaboration of: Brighton and Sussex Medical School Centre for Equitable Health Research, Whitman & Parrish, Green Healthcare Hub, Clean Hospitals, University of Geneva Institute of Global Health, University of West London, NHS Sussex, and Newcastle University. It is available online at: https://youtu.be/sWafXBOC KXM [31]

A way forward

Appropriate glove use and optimized hand hygiene are key to supporting patient safety and reducing the human and environmental impact of gloves. Training HCWs in a way that ensures comprehension and raising awareness of the issues around glove use have been proven to work in clinical practice to reduce inappropriate glove use and improve hand hygiene [32]. Institutions should support specialists such as infection prevention and control nurses to dedicate more time to delivering training and for monitoring in order to encourage good practice. Simultaneously, healthcare facilities should be encouraged to use those savings to purchase gloves that are made as locally as possible, and whose production methods are transparent.

Declarations

Conflict of interest

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