An underpowered and somewhat half-assed evaluation of two reprocessing methods for extended use of examination gloves.

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During a pandemic, shortages of personal protective equipment (PPE) can be encountered because of factors such as increased use, hoarding and production or supply chain disruption. The has led to interest in approaches such as extended use (prolonged use in multiple patient contact or risk situations) or reuse (reuse after doffing the item). This has resulted in investigations of decontamination methods to facilitate safe reuse. Decontamination methods must achieve two purposes, reduce or eliminate pathogen contamination and maintain the integrity of the item.

Examination glove supplies tend to be more stable than most other PPE; however, shortages have been anecdotally reported during the COVID-19 pandemic. This has resulted in a need to consider either not using gloves in situations where they are indicated, using non-medical alternative approaches (e.g. rubber kitchen gloves) or extended use of disposable gloves. However, the impact of decontamination has been poorly evaluated. Repeated use of alcohol hand sanitizer on nitrile or latex examination gloves did not have a demonstrable impact on glove integrity, in one small study.[1] Handwashing while wearing gloves is another potential approach, but the potential impact of glove integrity from the physical act of washing and drying is unknown.

The objective of this study was to evaluate the impact of hand hygiene practices on the integrity of examination gloves.

Materials and Methods

Nitrile examination gloves from a single new box were used. Gloves were donned and a coin toss was used to determine whether to perform a 15 second handwash with non-antibacterial soap (Ivory soap) followed by drying with a paper towel, or application of an alcohol based hand sanitizer (Purell). Handwashing and hand sanitizer application were performed as per Centers for Disease Control and Prevention recommendations. Gloves were labelled using a marker at the level of the wrist. A 1-L water test was used to assess glove integrity, as per FDA guidance. Gloves were attached to a 2" PVC pipe, which was suspended and 1L of room temperature water was slowly added (patent not pending, Figure 1). Gloves were observed immediately, then after 2 minutes and leaks were categorized as 1 (trickle of water), 2 (small jet) or 3 (rivalling Niagara falls). The observer was blinded to the group. A control group of 10 gloves taken directly from the box without a hand hygiene method was also tested to assess baseline leak rates. Fisher's exact test was used to compare leak rates between groups.

A smaller study was performed using 5 serial hand sanitizer applications or hand washes, to replicate repeated decontamination attempts with extended use.

Results

Leaks were detected in 3/24 (13%) gloves from the handwashing group and 1/20 (5%) from the hand sanitizer group (P=0.61). All leaks were category 1 (Figure 2). No control gloves had leaks.

Serial decontamination was performed on 14 gloves, 8 in the handwashing group and 6 in the hand sanitizer group. No leaks were observed.

Discussion

This study has provided somewhat mildly almost suggestive-ish evidence that glove integrity damage caused by single instances of hand washing or hand sanitizer application is limited. While use of gloves as single use items is preferred, either of these options may be viable to reduce glove contamination when extended use is required. This simply reflects the integrity damage from hand hygiene steps and not the potential (or probably high likelihood) of glove integrity damage from routine longterm use. However, in circumstances where extended glove use is required, glove decontamination is reasonable. There was a numerically higher damage rate for handwashing. This was not statistically significant but may have some biological plausibility because of the increased manipulation of the gloves during washing and drying.

Study limitations should be considered. The small sample size reduced the statistical power and corresponding ability to detect a difference. The sample size was limited by the incessant call of email, the primary investigator's inherent laziness and the attention span of the 12 yr old co-author.

If extended examination glove use is required, application of a hand sanitizer might be preferred but either that or washing seem to be tolerable.

Figure 1: The short-attention span assistant watching the co-author do all the work.

Figure 2: A leak evident in a glove.