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SHORT REPORT

# Evaluation of the acceptance of three types of alcohol-based hand sanitizing solutions by nursing professionals at a university hospital

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## Introduction

Effective hand hygiene (HH) by health professionals has been noted as the main measure to prevent and control healthcare-associated infections (HAI) and is one of the key elements for patient safety.[1] Despite its importance, many authors have described a low degree of compliance with HH. Therefore, to promote adequate HH among healthcare workers (HCWs) during their professional practice, the World Health Organization has emphasized the need to develop multimodal strategies. To maximize the acceptance of HH products by HCWs, the skin tolerance, product sensation and fragrance must be determined, and the comparative evaluations can be of great help in this process.[2]

This study was conducted with the aim of comparing the acceptability of three types of commercial alcohol-based solutions (ABSs) (gel, liquid and foam formulations) under working conditions.

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## Material and Methods

A cross-sectional study was conducted in three of the nine hospitalization facilities of the Infanta Leonor University Hospital in Madrid, Spain. The ABSs were distributed sequentially, without simultaneous use, and each solution was used by HCWs during their rounds for two weeks. The study was conducted on two facilities for six weeks, from November to December 2014, and on the remaining facility for six weeks, from May to June 2015. The principal active ingredients of the ABSs were a) gel: 70% ethanol and 10% propan-1-ol, b) liquid: 70% ethanol, 3% chlorhexidine digluconate, 0.1% benzalkonium chloride and 1% phenoxyethanol and c) foam: 65% ethanol, 10% propan-1-ol and <0.1% propan-2-ol. The acceptability of the ABSs was evaluated using a self-completed, anonymous and confidential questionnaire, prepared by the World Health Organization,[3] which was distributed to the floor nurses after using the three ABSs. The questionnaire evaluated nine items (colour, smell, texture, irritation/stinging, drying effect, ease of use, speed of drying, application and overall evaluation) using a Likert-type scale with 7 categories (1 - very poorly rated and 7 - very highly rated).

For analysis purposes, an item was considered favourably assessed when it scored 6 or 7 points on the Likert scale. The chi-square test with a statistical significance level of $p<0.05$ was used to examine the association between a favourable assessment of each item and the type of ABS.

## Results

Forty nursing professionals answered the questionnaire. The highest scoring ABS was the foam formulation, which obtained the highest favourable assessment percentages of all items considered, ranging from 40.0% for the item "drying effect" to 84.6% for the item "ease of use" (Table I). The results of the association analysis of the favourable assessment for each item and the type of ABS showed that the liquid formulation was rated significantly worse than the other two formulations (Table I).

## Discussion

To our knowledge, this is the first study in Spain that has compared the acceptability of foam, liquid and gel formulations of ABSs. Similar to other studies of ABSs, the most problematic issues corresponded to the dryness and irritation of the skin produced by these products.[4] For its part, similar to a study by Traore,[5] our study also suggests that a gel formulation is better accepted than a liquid formulation, but no significant differences were found between the foam and gel formulations in more than half of the items analyzed (including global evaluation item). However, caution should be exercised in making these comparisons, particularly if the findings of Stauffer[6] are taken into account, who, when comparing two gel and two liquid ABSs, found that one gel achieved the highest acceptance, while the other gel exhibited the worst acceptance. Therefore, studies that compare gel and liquid formulations must always consider the composition of the products.[6]

It is important to note that the ABS in our study that obtained the highest score in terms of skin irritation and dryness had the lowest concentration of ethanol, consistent with the findings of other authors who have demonstrated that the use of ABSs with higher concentrations of ethanol produced greater peeling of the skin.[7]

Despite the small number of HCWs that responded to the questionnaire, the low favourable assessment percentages exhibited by the three ABSs in the different items is worth noting, given that they did not exceed 70% in most cases (except for the items "ease of use" and "application" of the ABS in the foam formulation). These findings are important and its necessary to identify an ABS with higher favourable assessment percentages because this may help to improve the degree of compliance with HH (together with the implementation of other improvement measures).

Our small sample size, in addition to being similar to other studies,[8] was sufficient to detect significant differences in the items analyzed. Acceptance by medical personnel should be the specific subject of a subsequent investigation.

A requirement that must be assessed before a hospital proceeds with a purchase of ABS is the acceptability by the HCWs.[9] A product that is pleasant to use and

**Table I. Analysis of the association between the favourable assessment percentages of each item and the formulation type of the alcohol-based solution**

| Item evaluated | Foam formulation | Liquid formulation | Gel formulation | p* | p† | p§ |
|---|---|---|---|---|---|---|
| Colour | 67.5% | 14.8% | 52.5% | <0.001 | 0.002 | 0.171 |
| Smell | 60.0% | 7.4% | 42.5% | <0.001 | 0.002 | 0.117 |
| Texture | 51.3% | 14.8% | 45.0% | 0.002 | 0.010 | 0.576 |
| Irritation/ stinging | 52.5% | 14.8% | 22.5% | 0.002 | 0.435 | 0.006 |
| Drying effect | 40.0% | 8.0% | 20.0% | 0.005 | 0.294 | 0.051 |
| Ease of use | 84.6% | 25.9% | 55.0% | <0.001 | 0.018 | 0.004 |
| Speed of drying | 57.5% | 14.8% | 42.5% | <0.001 | 0.017 | 0.180 |
| Application | 75.0% | 7.4% | 45.0% | <0.001 | 0.001 | 0.006 |
| Overall evaluation | 62.5% | 11.1% | 52.5% | <0.001 | 0.001 | 0.366 |

*: Refers to the comparison of the favourable assessment percentages of the foam formulation compared to those of the liquid formulation.

†: Refers to the comparison of the favourable assessment percentages of the gel formulation compared to those of the liquid formulation.

§: Refers to the comparison of the favourable assessment percentages of the foam formulation compared to those of the gel formulation.

has no harmful effects on the hands is an essential element for achieving optimal HH.[10] Cost comparisons should be made only for ABSs that, in addition to the efficacy requirements, meet the requirements for acceptability.

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