Personal protective equipment and adverse dermatological reactions among healthcare workers: Survey observations from the COVID-19 pandemic

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Introduction

The recent pandemic of the 2019 novel coronavirus disease (COVID-19) has caused an unprecedented mobilization of the United States‘ healthcare workforce. In addition to working extended hours under increased duties, healthcare (HCP) of all states have been using various types of personal protective equipment (PPE) with greatly increased frequency and duration. While the use of PPE is critical for preventing HCP infection, these preventive measures can also cause acute and chronic dermatological, secondary infections, and aggravation of existing skin diseases. Consequently, unintended damage to the dermis and epidermis can increase the personal risk for secondary infection and, perhaps just as importantly, decrease compliance with necessary PPE protocol moving forward.

Prior to this study, there have been no data in the literature available regarding adverse effects of PPE use and increased frequency of use in the United States during the COVID-19 pandemic. Most studies have been conducted in China, where participants were limited to hospital staff only. Researchers found that, of 367 HCP respondents, 74.5% reported some form of adverse skin reaction. A similar survey recently conducted in Hubei, China reported an overall prevalence of skin damage among 42 PPE responders to PPE for more than 6 hours per day or washing their hands more than 10 times per day at greater risk.

In light of the COVID-19 pandemic and the strain that it, and future pandemics, can place on supply chains of critical PPE, it is more important than ever that decision-makers have access to pertinent data. The goal of this study was to evaluate PPE-related adverse reactions among healthcare workers of all professional roles about the prevalence and severity of adverse dermatological health effects attributable to exposure to protective equipment, particularly with regards to the PPE protocols currently in use.

Methods

The research vehicle employed by this study was a cross-sectional survey conducted to hospitalize healthcare workers currently employed at 3 hospital healthcare network in central western Kentucky. Survey participants were considered eligible if they were currently employed by a hospital and worked primarily in Kentucky. 438 invitations were distributed via email to hospital workers, and 879 surveys were collected and analyzed between the dates of 5/20-2020 and 6/11/2020. Completion of all 25 items was required for survey submission.

Results

Demographic data and selected response data are summarized in Table 2 and broken down by professional role in Figure 1. Of these, 478 (54.4%) respondents reported some type of skin irritation reaction; the vast majority of cases (46.3%) were among respondents who worked directly with patients versus those in administrative or nonmedical support roles.

The most common complaint was dryness/scaling of the skin (306 out of 439, 69.7%), and the most common location was the facial cheeks (305 out of 516, 59.1%). More serious experiences of irritation and maceration were reported to be relatively uncommon, reported by only 27 (6.1%) and 60 (13.7%) of 439 affected respondents, respectively; maceration were more common among those working in dedicated COVID unit (32.5% vs 17.1%, P<.0002). Skin discoloration was observed in 5.3% of 439, 22.5% among those working in the dedicated COVID unit (31.2% vs 17.1%, P<.0002), while acne (7% of 439, 17.1%) was significantly less reported in this group (9.1% vs 3.6%, P<.0002).

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Table 2 – Selected respondent data

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Table 1 - Data collected from respondents, with independent factors split into three categories

All statistical analyses were conducted using SYSTAT, version 13. Differences in the incidence of adverse skin reaction among groups tested for significance using Chi-Squared tests of association. Differences in the incidence of adverse skin reaction were determined using one-way ANOVA. The relationship between the dependent variables of severity and total days of irritation and patterns of PPE and disinfectant use were examined using stepwise linear regression.

In addition to the lack of clinical data regarding skin reactions, there has been significant uncertainty surrounding the appropriate use of PPE in both public and clinical settings, and guidance is often unclear. In light of this in mind, the results presented here identify several predictable trends between patterns of PPE use and associated dermatologic side-effects, but also offer several unexpected insights.

Discussion

Perhaps unexpectedly, age was found to have no effect on the risk of experiencing adverse skin reactions due to PPE use, which runs contrary to the well-established relationship between skin exposure to irritants and increased skin irritation. Further research would be required in order to delineate and clarify this particular finding.

Conclusions

The data collected by this study represent the largest and most comprehensive description of PPE-related adverse reactions among American HCP and possess significant relevance in the context of the COVID-19 pandemic. In the context of recent updates on PPE, these findings will be particularly pertinent to the current public health prevention guidelines. The most valuable aspect of this study is the data that may help ameliorate concerns that prolonged facial mask usage contributes to significant dermatologic morbidity among both medical professionals and public citizens.

These results represent the experiences of professional hospital workers who, on average, wear their extensive PPE for 7.7 hours per day, and under more demanding conditions than the average nonmedical worker. Generalizing these findings to the non-HCP public, it can be reasonably inferred that casual everyday wearers of facial masks have relatively little fear in the way of dermatological side effects.

The low levels of reaction severity and similarly low incidence of serious symptoms associated with PPE usage are reassuring and may provide some ancillary support for the most recent arguments from some public health experts that public facial mask should continue well after widespread COVID-19 vaccination, or that society should adopt regular seasonal mask use in order to decrease influenza infection rates.

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