


# Personal protective equipment and adverse dermatological reactions among healthcare workers

## Survey observations from the COVID-19 pandemic

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### Abstract

The 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 duress, healthcare professionals (HCP) of all stations have been making use of various types of personal protective equipment (PPE) with greatly increased frequency and duration. Current data regarding adverse skin reactions as a possible consequence of PPE use are, particularly in the United States, largely insufficient for policy-makers to make informed decisions regarding daily PPE use among HCP.

The research vehicle employed by this study is a cross-sectional 25-item survey distributed via email to workers currently employed by a five-hospital system in southcentral Kentucky. This survey was used to collect information from hospital workers of all professional roles about their experiences during the COVID-19 pandemic, focusing on reports of adverse dermatological reactions and associated risk factors.

Out of 879 respondents, 54.4% reported some type of skin irritation reaction. Skin irritation was significantly more prevalent among medical and medical support staff than non-medical hospital workers, with the highest prevalence among Certified Nurse Assistant (CNAs). Among clinical workers, those in dedicated COVID-19 units reported the highest prevalence of adverse skin reaction. 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%). Among those who reported skin irritation, the average self-reported severity of skin reaction (on a scale of 1–5) was  $2.00 \pm 0.05$ , and the mean total days of skin reaction per month was  $11.70 \pm 0.39$  days. Total days of irritation per month was found to be significantly related to “total days of PPE use per month,” “hours of PPE use per day,” “frequency of hand washing,” and “use of disinfecting UV irradiation.” Severity of skin reaction was found to be significantly related to “hours per day of PPE use,” “consecutive days of PPE use,” and “female sex.”

Clinical workers that put in the most face-to-face time with patients, and those in dedicated COVID-19 units, had the highest risk of adverse skin reaction. Overall, skin reactions were found to be mild, even in those hospital workers with the heaviest PPE use. Because the widespread and consistent use of facial masks in public settings has become a key tool in our protracted struggle with SARS-CoV-2, these findings may help to ameliorate concerns that everyday facial mask and/or other PPE usage contributes to significant dermatologic morbidity among both medical professionals and public citizens.

**Abbreviations:** CDC = centers for disease control and prevention, CNA = certified nurse assistant, COVID-19 = 2019 novel coronavirus disease, HCP = health care professionals, PPE = personal protective equipment, UVGI = ultraviolet germicidal irradiation.

**Keywords:** contact dermatitis, 2019 novel coronavirus disease, dermatology, healthcare personnel, protective equipment, survey, ultraviolet germicidal irradiation

Editor: Flavio Palmieri.

Supplemental Digital Content is available for this article.

The authors have no conflicts of interests to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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How to cite this article: Nguyen C, Young FG, McElroy D, Singh A. Personal protective equipment and adverse dermatological reactions among healthcare workers: survey observations from the COVID-19 pandemic. *Medicine* 2022;101:9(e29003).

Received: 22 March 2021 / Received in final form: 17 December 2021 / Accepted: 30 December 2021

<http://dx.doi.org/10.1097/MD.00000000000029003>

## 1. 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 duress, healthcare professionals (HCP) of all stations have been making use of 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 dermatitis, secondary infections, and aggravation of existing skin diseases.<sup>[1]</sup> 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. These concerns have been raised by several recent articles,<sup>[2–3]</sup> but such arguments can only carry so much weight without the reproducible data necessary to corroborate them.

Currently, there are no data in the literature available regarding adverse effects of PPE use and increased handwashing/sanitizing in the United States during the pandemic. While several studies have been conducted in China, they offer only limited analysis of the various risk factors that can contribute to skin reactions. In 1 recent study, conducted at the pandemic epicenter of Wuhan, researchers found that, of 367 HCP respondents, 74.5% reported some form of adverse skin reaction.<sup>[4]</sup> A similar survey recently conducted in Hubei, China reported an overall prevalence of skin damage among 542 HCP respondents at 97%, with workers wearing their PPE for more than 6 hours per day or washing their hands more than 10 times per day at greater risk.<sup>[5]</sup> A limited survey of 129 HCP in Hangzhou, China reported a 94.57% prevalence of discomfort due to tertiary PPE use, including varying degrees of adverse skin reactions, respiratory difficulties, heat stress, dizziness, and nausea.<sup>[6]</sup> Following these studies, several professional Chinese dermatology organizations have jointly written a consensus paper detailing the antagonistic effects of prolonged PPE use and offering structured advice for the prevention of the most common skin injuries.<sup>[7]</sup> Another study coming from Poland with a much larger sample size of 2307 non-healthcare respondents provided a positive correlation between both duration and frequency of medical mask usage and self-reported "facial itch."<sup>[8]</sup>

In light of the current pandemic and the strain that has been placed on supply chains of critical PPE, it is more important than ever that decision-makers have access to pertinent data. Hence, the authors have endeavored to gather and provide substantive data from American hospitals about the prevalence and severity of adverse dermatological health effects attributable to overuse of personal protective equipment, so that healthcare workers and the administrators that form clinical health policies can make informed decisions.

## 2. Methods

### 2.1. Study design and setting

The research vehicle employed by this study was a cross-sectional survey distributed to hospital healthcare workers currently employed by a 5-hospital healthcare network in central and western Kentucky. The goal of this study was to collect information from hospital workers of all professional roles about their experiences during the COVID-19 pandemic.

### 2.2. Data collection

Survey participants were considered eligible if they were currently employed by a hospital and worked primarily in Kentucky. 4366 invitations were distributed via email to hospital workers, and 879 responses (20.1%) were collected between the dates of 5/29/2020 and 6/11/2020. Completion of all 25 items was required for survey submission. Information collected from every respondent includes demographic data, profession, working hours and conditions, exposure to COVID-19 positive patients, and precise data regarding the type, duration, and usage of PPE. This data is summarized in Table 1. The survey concluded by collecting the details of any adverse dermatological reactions occurring over the previous 30 days and asking respondents to self-grade the overall severity of their reactions on an ascending scale from 1 (minor) to 5 (severe).

### 2.3. Bias considerations

As with all survey-based studies, this cross-sectional study of hospital workers is vulnerable to several sources of bias, which were considered and guarded against, both the design and execution of the project. The most probable cause of bias in this study is nonresponse bias. Because our data is collected from a voluntary survey, those HCP who have experienced adverse reactions or with otherwise negative experiences over the past 30 days are more likely to complete the survey. In this context, nonresponse bias would skew results towards higher measures of skin reaction prevalence and severity. To minimize response bias, surveys were distributed only to actively employed hospital workers, and responses were collected anonymously. In addition, the survey included only simple, single-sentence questions. All survey items were confined to a single page and were written to be short, straightforward, and answerable in multiple-choice format. The survey provided no incentive for completion.

### 2.4. Statistical analysis

All survey data were obtained directly from a downloadable survey database. 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 mean severity and total days of irritation were tested for significance using Mann–Whitney *U* tests. 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.

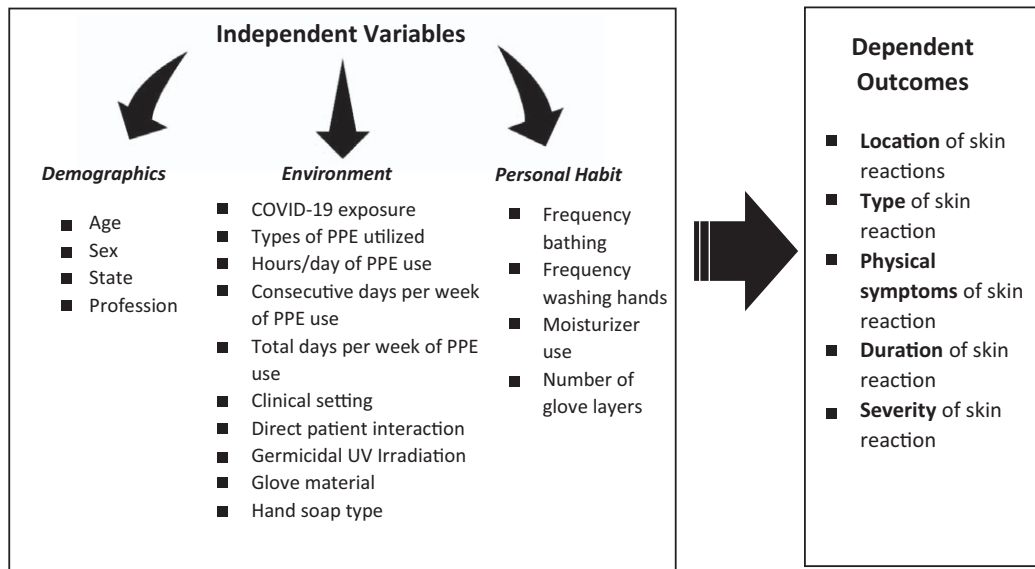
### 2.5. Ethical considerations

This research project was sponsored by The Medical Center of Bowling Green, KY. The Institutional Review Board (IRB) for this institution approved the clinical protocol for this project and all survey questions prior to survey distribution. All survey responses were received on a completely voluntary basis. Respondents did not receive any compensation or incentive for their responses. All respondent data was anonymized prior to statistical analysis.

## 3. Results

Eight hundred seventy nine (879) responses were collected between the dates of 5/29/2020 and 6/11/2020, corresponding to

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



a response rate of 20.1%. Demographic data and selected response data are summarized in Table 2 and broken down by category in Figures 1–4. Of these, 478 (54.4%) respondents reported some type of skin irritation reaction; the vast majority of

these cases (401, 84.0%) 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

**Table 2**  
Selected respondent data.

	Total respondents (%)	Prevalence of skin reaction (%)	Mean severity of reaction	Mean days per month of irritation	Mean hours per day PPE Use	Mean consecutive days per week PPE use
Sex		(N=879)				
Male	142 (16.1)	46 (32.4)	1.63±0.89	10.51±8.31	6.24±3.23	4.53±1.42
Female	737 (83.8)	432 (58.6)	1.97±0.97	11.55±8.72	8.05±3.34	3.77±1.4
Age						
0–29	163 (18.5)	116 (71.2)	1.9±0.96	11.7±8.84	9.11±3.23	3.55±1.34
30–39	231 (26.3)	144 (62.3)	1.9±0.96	11.39±8.83	7.74±3.24	3.82±1.42
40–49	204 (23.2)	113 (55.4)	2.05±0.94	12.12±8.36	7.72±3.21	3.88±1.42
50–59	199 (22.6)	81 (40.7)	1.93±1.01	10.83±8.87	6.94±3.46	4.16±1.47
60–69	81 (9.2)	24 (29.6)	1.81±1.01	10.03±8.37	7.05±3.66	4.22±1.47
Professional role						
Nursing (APRN/RN/NP)	276 (31.4)	183 (66.3)	1.95±0.9	11.28±8.62	9.37±3.18	3.30±1.25
Nonmedical support (Coding/Billing/Records/Security/Kitchen)	171 (19.4)	55 (32.2)	1.76±0.89	10.16±8.62	5.42±3.27	4.53±1.5
Medical support (Technician/Pharmacy/Lab)	124 (14.1)	76 (61.3)	1.87±0.96	11.46±8.83	7.10±2.93	4.09±1.39
Therapist/other medical assistant	120 (13.6)	66 (55)	1.81±0.91	10.4±8.28	7.31±3.02	4.28±1.22
Medical assistant (PA/CNA)	79 (9)	56 (70.9)	2.24±1.13	13.61±9.04	9.87±2.62	3.36±1.35
Clinical management (Registration/Clerk/Manager)	62 (7)	22 (35.5)	2.07±1.05	13±9.38	6.93±2.11	4.38±1.35
Physician (DO/MD)	47 (5.3)	20 (42.5)	1.95±1.16	12.61±8.04	6.12±2.79	4.27±1.55
Unit						
Medical unit	194 (22.1)	130 (67)	1.88±0.97	10.8±8.81	9.06±3.31	3.51±1.39
Outpatient	178 (20.2)	90 (50.6)	1.85±0.91	11.34±8.9	6.76±2.18	4.52±1.15
I Don't work with patients	174 (19.8)	42 (24.1)	1.7±0.96	9.69±7.96	5.24±3.07	4.51±1.63
Emergency department	89 (10.1)	60 (67.4)	2.15±1.06	11.64±8.43	8.22±3.8	3.21±1.31
Intensive care unit	54 (6.1)	33 (61.1)	2.18±0.93	13.63±7.78	10.29±2.49	3.2±0.98
Dedicated COVID-19 unit	51 (5.8)	39 (76.5)	2.12±1.05	12.02±8.9	9.92±3.04	3±1.08
Surgical unit	50 (5.7)	25 (50)	1.93±0.89	13.83±10.84	8.12±2.93	4.02±1.44
Multiple-unit support	37 (4.2)	23 (89.2)	1.92±0.86	8.84±7.61	6.32±3.07	4.31±1.04
Long-term care	28 (3.2)	20 (71.4)	2.1±0.97	14.2±8.37	9.36±2.41	3.93±1.44
Imaging/Laboratory	24 (2.7)	16 (66.7)	1.65±0.86	12.25±7.58	7.79±3.28	3.91±1.19

common location was the facial cheeks (305 out of 516, 59.1%). More serious experiences of fissures and maceration were found to be relatively uncommon, reported by only 27 (6.2%) and 60 (13.7%) of 439 affected respondents, respectively; macerations were more common among those working in dedicated COVID unit (20.2% vs 11.5%,  $\chi^2=5.22$ ,  $df=1$ ,  $P=.02$ ). Skin discoloration (91 of 439, 20.7%) was also significantly more frequent among those working in the dedicated COVID unit (31.2% vs 17.3%,  $\chi^2=9.66$ ,  $df=1$ ,  $P=.002$ ), while acne (75 of 439, 17.1%) was significantly less reported in this group (10.1% vs 19.4%,  $\chi^2=5.00$ ,  $df=1$ ,  $P=.025$ ).

Medical staff were significantly more than twice as likely to report adverse skin reactions than others (62.1% vs 33.0%,  $\chi^2=58.16$ ,  $df=1$ ,  $P<.001$ ). Adverse skin reaction was most commonly reported by medical assistants (Physician Assistant or CNA) (56 of 79, 70.9%), followed by nursing staff (183 of 276, 66.3%), while physicians and other medical assistants/therapists reported a lower-than-average overall prevalence (20 of 47, 42.6% and 66 of 120, 55.0%, respectively).

One hundred eighty two (182) respondents reported both regularly wearing gloves and adverse skin reaction on their hands. Chi-Squared tests of association revealed no statistically significant relationship between glove material type and incidence of any symptom (dryness, itching, erosion, maceration, etc.).

Adverse skin reaction was observed significantly more among those who regularly worked with confirmed COVID-positive patients (109 of 154, 70.8%) than those who did not (330 of 575, 57.4%) ( $\chi^2=9.088$ ,  $df=1$ ,  $P=.003$ ).

Among those who worked directly with patients, adverse skin reaction was most commonly reported by individuals working in a dedicated COVID-19 unit (39 of 51, 76.5%) followed by those working in a long-term care unit (20 of 28, 71.4%). The lowest prevalence was reported by individuals working in surgical (25 of

50, 50.0%) and outpatient units (90 of 178, 50.6%), while those working in the emergency department (60 of 89, 67.4%) and intensive care unit (33 of 54, 61.1%) were intermediate. The variation in prevalence among units was statistically significant ( $\chi^2=21.90$ ,  $df=1$ ,  $P=.007$ ).

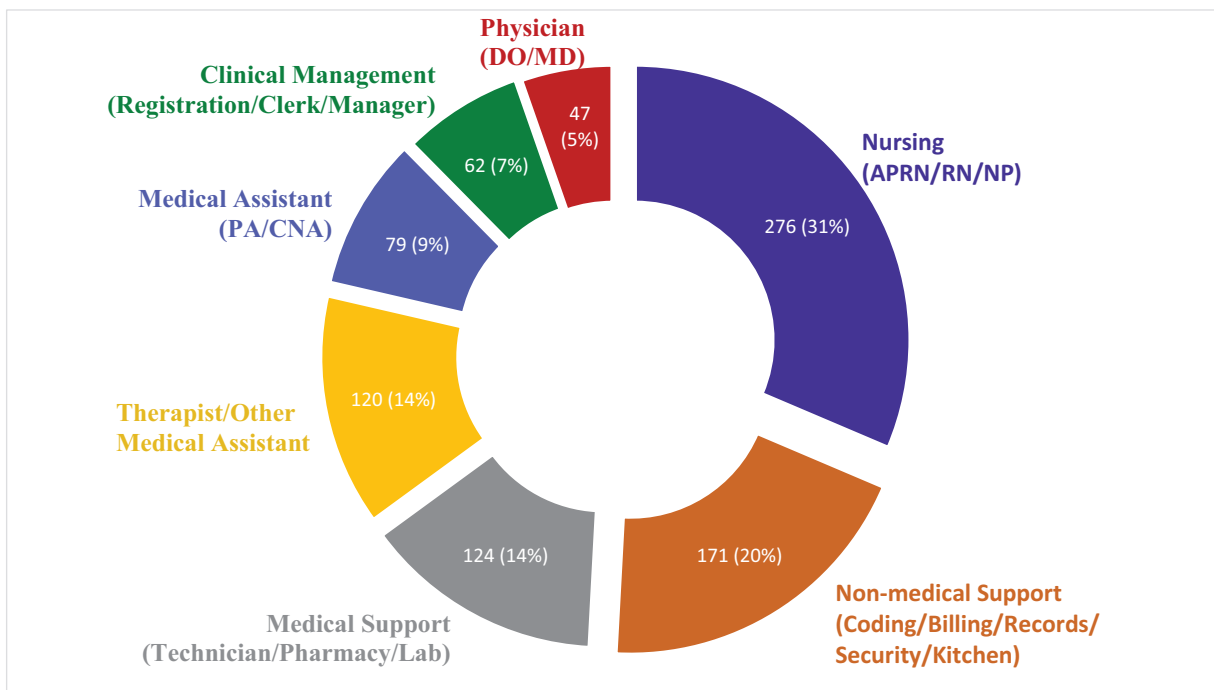
Despite observed differences in overall prevalence, differences in the magnitude of impact were limited. Among those who reported skin irritation, the average self-reported severity of skin reaction was  $2.00 \pm 0.05$ , and the mean total days of skin reaction over the previous 30 days was  $11.70 \pm 0.39$  days. Both severity ( $U=37,850.5$ ,  $df=1$ ,  $P=.004$ ) and total days of irritation ( $U=38887.5$ ,  $df=1$ ,  $P=.018$ ) were significantly greater among individuals working with confirmed COVID patients versus those who did not, though the absolute differences in means were modest.

There was a significant relationship between both severity of skin reaction ( $F_{5,472}=6.27$ ,  $P<.0001$ ) and total days of irritation ( $F_{6,471}=5.24$ ,  $P<.0001$ ) and use of PPE and disinfecting agents. More severe reactions were linked to

1. more hours per day of PPE use ( $b=0.06$ ,  $t=3.98$ ,  $P<.0001$ ),
2. more consecutive days of PPE use ( $b=0.08$ ,  $t=2.51$ ,  $P=.012$ ), and female gender ( $b=0.36$ ,  $t=2.35$ ,  $P=.019$ ).

By contrast, total days of adverse reaction reported in a month increased with

1. more total days of PPE use per month ( $b=1.22$ ,  $t=3.70$ ,  $P=.0002$ ),
2. greater frequency of handwashing ( $b=0.14$ ,  $t=2.68$ ,  $P=.007$ ), and
3. more hours of PPE use per day ( $b=0.29$ ,  $t=2.04$ ,  $P=.042$ ), but
4. less use of ultraviolet germicidal irradiation (UVGI) as a disinfecting agent ( $b=-1.87$ ,  $t=-2.38$ ,  $P=.017$ ).



**Figure 1.** Respondent by Professional Role.

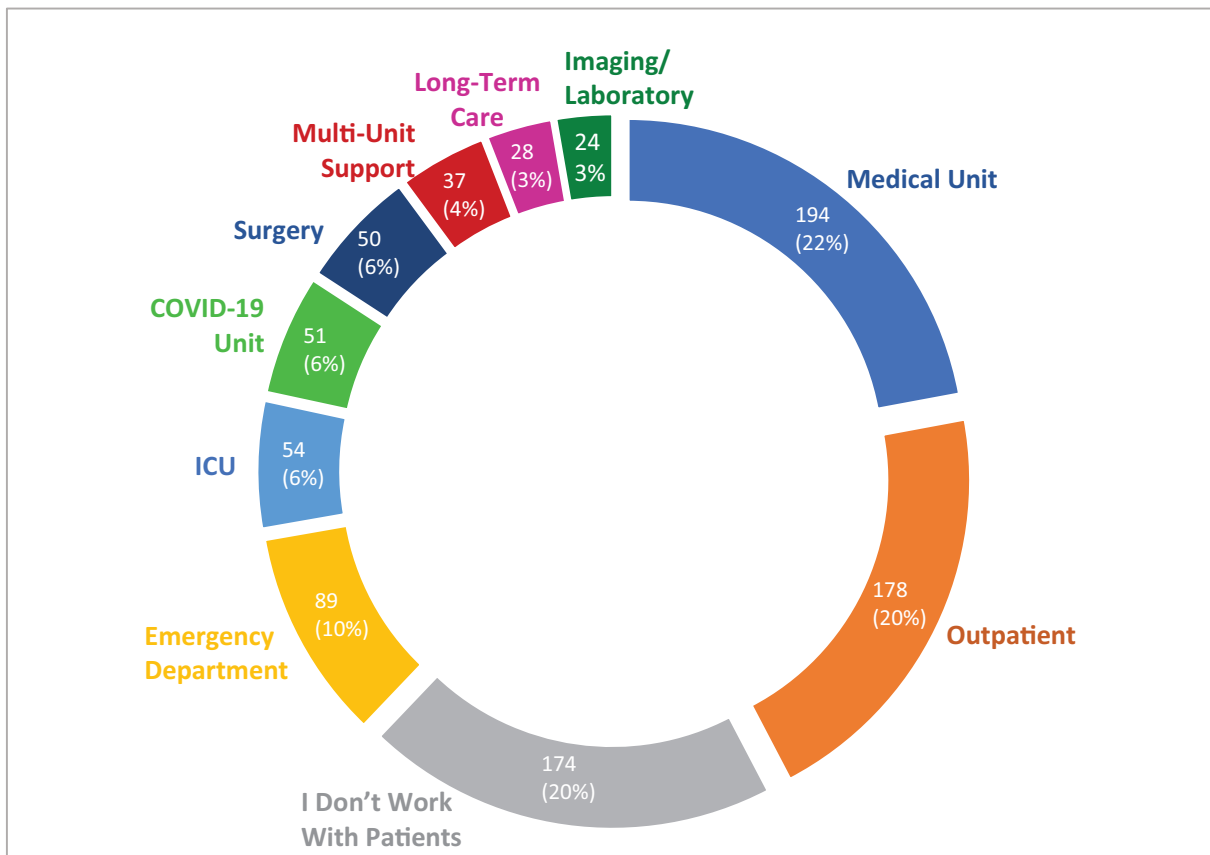


Figure 2. Respondent by Hospital Unit.

While significant, these relationships only account for a small proportion of the variation in skin reactions (adjusted  $R^2=0.05$  for both); the vast majority (95%) of the variation among individuals in severity and duration of skin irritation is either random or due to factors not accounted for in this study.

#### 4. Discussion

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, particularly regarding facial masks. Centers for Disease Control and

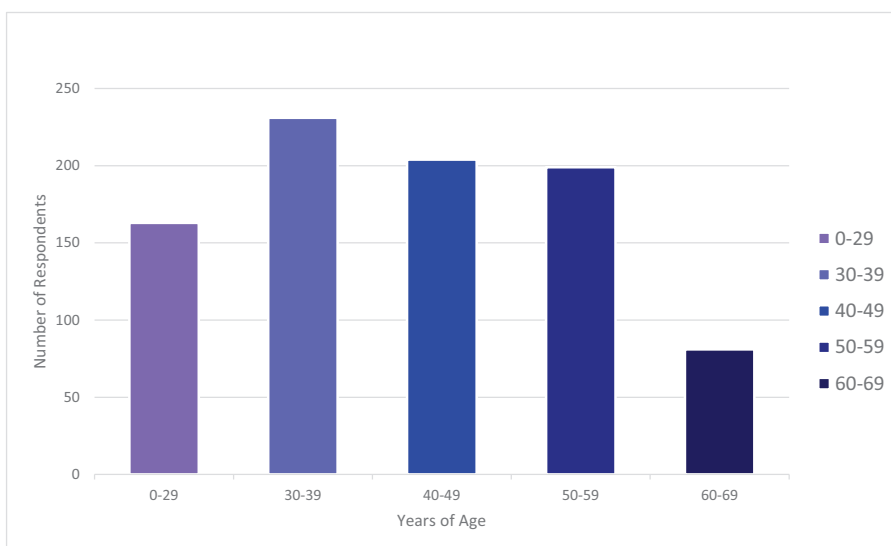


Figure 3. Respondent by Age.

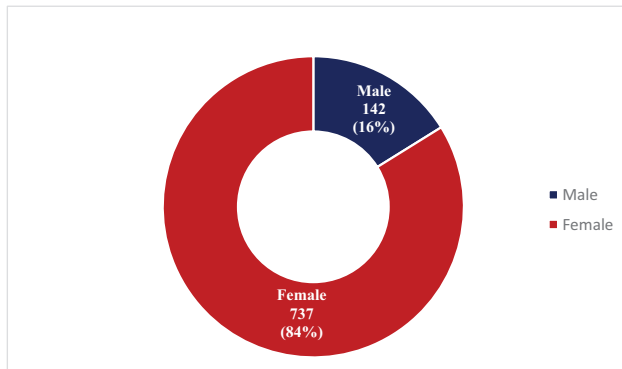


Figure 4. Respondent by Sex.

Prevention (CDC) guidelines regarding PPE have changed course several times since the advent of COVID-19, and while they have stabilized in recent months, they do not offer any guidance with reference to the duration of daily PPE use, or guidelines for minimizing adverse reactions among HCP. And while making such recommendations is beyond the scope of this observational report, the authors hope that the data provided may help inform the future development of any such guidelines.

With this goal in mind, this study represents the largest and most comprehensive description of PPE-related adverse reactions among American HCP and possesses significant relevance in the context of the COVID-19 pandemic. The results identify predictable trends between patterns of PPE use and associated dermatologic side-effects, but also offer several unexpected insights.

First, these data support the supposition that those hospital workers that commonly put in the most face-to-face time with patients (i.e., nurses and CNAs) also run the highest risk of developing some type of adverse skin reaction. Similarly, those working primarily in dedicated COVID-19 units reported the highest prevalence of skin reaction. These findings remind us that while in many cases prolonged PPE use, while necessary, is not wholly without detriment.

The primary dependent outcomes of interest, severity, and duration of adverse skin reaction, were both found to be positively related to total hours per day of PPE use, while duration and severity had a positive relationship with total days of PPE use per month and consecutive days of PPE use per week, respectively. However, despite statistical significance, these variables accounted for only a minimal amount of the reported variation in skin reactions, meaning that most of this variation is a function of variables not measured by our survey.

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 irritation, dermatitis, and breakdown with increasing age.<sup>[9,10]</sup> Further research would be required in order to delineate and clarify this particular finding.

Similarly, female gender was found to increase severity of skin reaction. However, it must be considered that female gender simply approximates other variables, such as profession. In the United States female nurses and CNA's, those associated with the highest risk of skin reaction, outnumber their male counterparts by a ratio of nearly 4:1, which may account for this gender disparity.<sup>[11]</sup> Of all the personal habits measured such as

moisturizer use, frequency of bathing, and layers of gloves worn at work, only the frequency of handwashing throughout the day was found to significantly increase the risk of adverse skin reaction.

Greater than one-third of respondents that reported adverse skin reactions reported involvement of the hands. No relationship was found between glove material type (nitrile, latex, etc.) and incidence of any symptom (dryness, itching, erosion, maceration, etc.) This suggests that skin irritation (at least on the hands) seems to be a function of usage, and not allergic reaction to a particular material. Further speculation as to the precise physiologic etiology of PPE-related adverse skin reactions lies outside the scope of this paper but would be a valuable topic to explore further in future studies.

Interestingly, the UVGI at work was found to be associated with a reduction in total days of skin irritation. This relationship may be largely attributable to the established microbicidal benefits of UVGI in clinical settings.<sup>[12]</sup> Indeed, UVGI has proved effective as an adjunct disinfection process by inactivating severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), the coronaviruses that cause severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), respectively.<sup>[13]</sup> As a member of the coronavirus family, the SARS-CoV-2 should theoretically also be vulnerable to inactivation,<sup>[14]</sup> but to date, there is no primary evidence to confirm this.<sup>[15]</sup> Due to this lack of conclusive evidence the use of UVGI, both for clinical sterilization and personal decontamination, remains controversial.<sup>[16]</sup> The World Health Organization (WHO) has stated that UV lamps should *not* be used for the purpose of SARS-CoV-2 decontamination because they can cause skin irritation and cause inadvertent eye damage.<sup>[17]</sup> The FDA acknowledges these same risks but suggests using UVGI to augment disinfection of healthcare environments after manual cleaning and even endorses the private use of home UV lamps.<sup>[18,19]</sup> The CDC also endorses the use of UVGI in clinical and workplace settings to combat the SARS-CoV-2 virus,<sup>[20]</sup> on the basis that this technology has been safely used for decades to control various infectious pathogens such as *M. tuberculosis*.<sup>[21]</sup> The finding of this study support the positions of the Food and Drug Administration and CDC.

#### 4.1. Limitations

As with all survey-based studies, this cross-sectional study of hospital workers is not without its limitations. The most probable cause of bias in this study is nonresponse bias. Because our data is collected from a voluntary survey, those HCP who have experienced adverse reactions or with otherwise negative experiences over the past 30 days are more likely to complete the survey.<sup>[22]</sup> In this context, non-response bias would skew results towards higher measures of skin reaction prevalence and severity. The data do not include HCP working in out-patient clinics, nursing homes, or other small-scale medical facilities, and future studies would benefit from including analysis of these secondary clinical settings. Furthermore, one-fifth of respondents reported that they have no significant contact with patients, and only 5% of total responses received were provided by physicians.

Additionally, this study has a strong regional focus and relies on data obtained from hospital workers in south-central Kentucky only. Geographic factors such as average temperature and humidity are not considered in this study but are important

<b>Table 3</b>	
<b>Methods and practices for preventing PPE-related adverse skin reaction.</b>	
General	<ul style="list-style-type: none"> <li>• When possible, give skin a break from contact with PPE. For every two hours wearing PPE, try to take a break for at least 15 minutes, if safe and practical to do so.<sup>[26]</sup></li> <li>• Regularly inspect your skin for redness, irritation, or soreness. Pay particular attention to areas that are commonly in direct contact with PPE.<sup>[27,28]</sup></li> <li>• Keep showers or baths short, limiting to about five to ten minutes, using warm NOT hot water, and using mild soaps (e.g., Dove Sensitive Skin, Cetaphil).<sup>[29]</sup></li> <li>• Apply moisturizer liberally, regularly, and whenever skin feels dry.<sup>[29,30–32]</sup> Lean towards creams and/or ointments (e.g., CeraVe, Eucerin, Vaseline, Aquaphor) over lotions, which are less moisturizing.<sup>[26,29,32]</sup></li> <li>• Try not to let your skin come into direct contact with chemicals that are used for surface disinfection.<sup>[33]</sup></li> </ul>
Hands	<ul style="list-style-type: none"> <li>• Use alcohol-based hand sanitizer unless hands are visibly dirty.<sup>[33]</sup> Avoid using hand sanitizer and soap one right after the other. Consecutive use increases skin damage.<sup>[30]</sup></li> <li>• Use lukewarm water rather than hot water,<sup>[34]</sup> particularly when hands are cold. Water temperature during washing has an important effect on the onset of irritant contact dermatitis, and frequent use of hot water can lead to excessively dry skin.<sup>[33]</sup></li> <li>• Apply an ointment-based emollient during work time after hand washing and after work, at home, to support the regeneration of the skin barrier.<sup>[35]</sup></li> <li>• Consider wearing a cotton liner under gloves to prevent irritation from sweat if wearing for extended periods of time.<sup>[36]</sup></li> </ul>
Face	<ul style="list-style-type: none"> <li>• Ensure PPE fits properly and avoid over-tightening masks, goggles, etc.<sup>[27,28]</sup></li> <li>• Make sure skin and PPE are both clean and dry before donning PPE.<sup>[27]</sup></li> <li>• Apply protective barrier films or creams to any area that is likely to be affected by moisture from sweat. Allow barrier films to dry completely before applying PPE (~90 seconds).<sup>[28]</sup></li> <li>• Zinc oxide may have some anti-inflammatory properties.<sup>[32]</sup> Apply across the bridge of the nose, behind ears, under the chin, etc. as a barrier to reduce friction.<sup>[32]</sup></li> </ul>

factors in skin breakdown. Colder/drier regions of the country would likely demonstrate increased frequency and severity of skin reaction,<sup>[2,31]</sup> and future studies would benefit from a larger geographic distribution. Last, very little of the variation among individuals in severity and duration of skin reaction was accounted for by the variables measured in this analysis, and further investigation is required to determine which factors are the true determinants of PPE-related skin reaction among HCP.

### 5. 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 current pandemic. In the context of resistance to public mask use from certain quarters, perhaps the most relevant and 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 nonHCP public, it can be reasonably inferred that casual everyday wearers of facial masks have relatively little to fear in the way of dermatological side effects.

Indeed, the widespread and consistent use of facial masks in public settings has become a key tool in our protracted struggle with SARS-CoV-2. 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,<sup>[24]</sup> or that society should adopt regular seasonal mask use in order to decrease influenza infection rates.<sup>[25]</sup>

For these reasons and a myriad of others, it seems likely that utilization of PPE, among both HCP and the general public, will persist as an increasingly valued public health tool to combat communicable disease. Because of this, it is also increasingly

important that proven methods for the prevention of PPE-related adverse skin reactions are widely disseminated. A summary of the most commonly advocated methods and practices is contained in Table 3.

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### Acknowledgments

The authors would like to thank Dr. Melinda Joyce and the Medical Center of Bowling Green KY for their guidance and support.

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