



## Original Article

# A survey of healthcare workers on the acceptance and value of personal protective equipment for patient care

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### Abstract

**Objective:** Assess healthcare workers' (HCW) attitudes toward universal masking, and gowns and gloves used as part of transmission-based precautions.

**Design:** Cross-sectional survey.

**Setting:** Academic, tertiary care medical center in Baltimore, Maryland.

**Participants:** HCW who work in patient care areas and have contact with patients.

**Methods:** In May 2023, a 15-question web-based survey was distributed by the hospital's communications team via email. The survey contained questions to assess HCW perceptions of universal masking policies prior to the availability of COVID-19 vaccines and at the time of the survey, and the use of gowns and gloves for transmission-based precautions. Descriptive statistics were used to summarize data. Differences in agreement with universal masking over time, level of agreement with gown and glove policies, and with all PPE types across respondent characteristics were assessed.

**Results:** 257 eligible respondents completed the survey. Nurses and patient care technicians (43%) and providers (17%) were the most commonly reported roles. Agreement with universal mask use decreased from 84% early in the pandemic to 55% at the time of the survey. 70% and 72% of HCW agreed masks protect themselves and others, respectively. 63% expressed any level of annoyance with mask wearing, the most often due to communication challenges or physical discomfort. 75% agreed with gown use for antibiotic-resistant bacteria compared with 90% for glove use.

**Conclusions:** The majority of HCW agree with the use of PPE to prevent pathogen transmission in the healthcare setting. Agreement with universal mask use for patient care shifted during the COVID-19 pandemic.

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### Introduction

Personal protective equipments (PPEs) are essential components of standard precautions and transmission-based precautions in healthcare facilities to mitigate the risk of blood-borne pathogen exposure and reduce the risk of organism transmission. During the COVID-19 pandemic, masks were integrated into standard precautions in healthcare facilities as a broad, universal strategy for source control of asymptomatic or pre-symptomatic infections and to prevent transmission amongst staff and patients.<sup>1,2</sup> As the impact of COVID-19 on individuals and healthcare facilities diminished over time, many have de-implemented universal mask policies.<sup>3,4</sup>

Studies have demonstrated that transmission of multi-drug resistant organisms frequently occurs from patients to gowns and gloves worn by healthcare workers (HCW), suggesting they serve as a barrier for the transmission of organisms.<sup>5–7</sup> As hospitals develop infection prevention policies for transmission-based precautions however, additional considerations should be taken into account beyond their effectiveness including cost, ease of use, and impact upon the workflow of the bedside staff. A few studies have evaluated patient perceptions of glove and gown transmission-based precautions, however there is very limited data evaluating the perceptions of HCWs.<sup>3,8–11</sup> Similarly, although public support for mask use was polled frequently during the COVID-19 pandemic, there are no equivalent surveys focused on HCWs. The aim of this study was to assess HCWs' attitudes toward universal masking, gowns and gloves as part of transmission-based precautions, and the impact of the COVID-19 pandemic on each.

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## Methods

The University of Maryland Medical Center (UMMC) is a large, urban academic hospital in Baltimore, MD comprised of two distinct campuses with a combined 860 beds, approximately 10,000 employees, and over 2500 faculty and resident physicians. As part of enhanced infection prevention practices implemented during the COVID-19 pandemic, UMMC policy required masking by all HCW engaged in direct patient care beginning April 6, 2020. This policy remained in effect until May 11, 2023, at which time masking became optional in most patient encounters, except for contact with immunosuppressed patients, upon patient or family request, or as part of PPE protocols for other respiratory pathogens.

On May 15, 2023, a 15-question web-based survey (Qualtrics, Seattle, WA) was distributed to all UMMC employees and physicians via a regularly scheduled, weekly email from the hospital's communications team with an invitation to participate for team members that "work in patient care areas and have contact with patients" (Supplemental Material). The survey was comprised of 7-point Likert scale questions to assess HCW perceptions of the value of masks, gowns, and gloves as PPE for patient care. Questions included the level of agreement with each type of PPE (individual questions for mask, glove, and gowns) on the following constructs: (1) a protection for themselves from getting infected, (2) a protection for others, ie, patients and other HCW from getting infected, (3) an annoyance to wear while at work, and (4) a barrier that impedes the ability to do day-to-day work, among others. Specific for masks, two questions were included to measure the level of agreement with hospital policies that required mask use for any interaction with patients; one pertaining to the early phase of the pandemic prior to the availability of vaccines, and the other pertaining to 2023. If respondents indicated any level of agreement that masks are "annoying to wear while at work," a list of potential reasons for the annoyance was provided with instructions to select the top three. Basic demographic questions were included but optional; role in the hospital, institutional and healthcare experience, campus of practice, and age. The survey was voluntary, anonymous, and no compensation was provided.

To encourage participation, in addition to the email that was distributed on May 15, 2023, the survey was discussed at a safety huddle that occurs on UMMC's two campuses each weekday with clinical and operational leadership from every department represented. Subsequently, advertisements for the survey with a QR code were posted on all nursing units during the week of July 17, 2023. The survey was closed on August 15, 2023.

Responses to survey questions were tabulated by level of agreement. Responses of "Agree" and "Strongly Agree" were combined into a single category during some of the analyses, as were "Disagree" and "Strongly Disagree." Comparison of agreement with universal masking policies in the early COVID-19 pandemic and 2023 was performed with McNemar's test. The statistical significance of differences in agreement with mask, gown, and glove policies across respondent characteristics were assessed with Pearson's chi-square tests. Logistic regression analyses were performed to estimate the odds of agreement with the policy of universal mask use for patient care in 2023, adjusting for the level of agreement with other queried sentiments about mask protection, annoyance, and as an impediment to performing work. Respondent agreement with policies for gown and glove use for patients with antibiotic-resistant bacteria was compared using McNemar's test. Correlation of respondent level of agreement with policies for mask, gown, and glove use was measured with the Pearson coefficient. All data analysis was performed using SAS 9.4

(Cary, NC). This study was determined to be exempt by the University of Maryland, Baltimore Institutional Review Board.

## Results

A total of 269 respondents completed the survey, of whom 12 did not meet eligibility criteria as individuals who "work in patient care areas and have contact with patients" based on self-reported role in the hospital. Among the 257 eligible respondents, 232 self-reported demographic information which are shown in Table 1. Based on responses, occupations were categorized into four groups for the purposes of analysis: providers (physicians and advanced practice providers), nurses and patient care technicians, patient care and rehabilitation services (physical therapy, occupational therapy, and respiratory therapy), and other. Among the 78 respondents whose role was categorized as "other," the most common occupations were radiology/ultrasound technician (11, 5%) and unit administrative staff (4, 2%); 36 (16%) self-categorized as "other" but did not provide any additional information about their occupation.

Table 2 summarizes survey responses for key policy questions related to mask, gown, and glove use. There were significantly fewer respondents that agreed with universal masking in 2023 compared with early in the pandemic (84% vs 55%,  $P < 0.0001$ ). Differences in universal masking policy agreement between the two periods occurred across all hospital roles except for patient care and rehabilitation services, who had the highest proportion of agreement with a 2023 universal mask policy ( $n = 11$ , 73%).

Additional sentiments about mask wearing are found in Table 3. Agreement that masks impede work was significantly associated with disagreement that they should be used universally for patient care in 2023 ( $P < 0.0001$ ). Adjusting for other sentiments about mask use, the odds of agreement with universal masking in 2023 were significantly increased among those who agree that masks protect themselves (OR 5.13 [1.67, 15.84]  $P = 0.0045$ ) but did not meet statistical significance among those who agree that masks protect others (OR 3.26 [0.96, 11.03]  $P = 0.0579$ ). Of the 161 (63%) of respondents that expressed any level of annoyance with mask wearing at work, the most common reasons were: masks make communication with my patients and other employees difficult ( $n = 102$ , 63%), it is difficult to breathe through a mask ( $n = 71$ , 44%), masks are hot ( $n = 70$ , 43%), masks hurt my ears ( $n = 69$ , 43%), skin damage/irritation from use ( $n = 66$ , 41%), and masks fog my glasses ( $n = 60$ , 37%).

When asked about the use of gowns and gloves to care for patients with antibiotic-resistant bacteria, 184 (75%) agreed with gown use and 222 (90%) agreed with glove use. For both gowns and gloves, there were no statistically significant differences in the level of agreement with use across respondent hospital roles, years of experience, or age. There was a trend towards nurses and patient care technicians having the lowest level of agreement with gown use (67%,  $P = 0.078$ ). Seventy-one (29%) respondents agreed that gowns are annoying to wear at work, compared with 20 (8%) who felt similarly about glove use. Only 14 (6%) and 11 (5%) respondents agreed that gowns and gloves, respectively, are an impediment to their ability to do work. Agreement that gowns impede work was significantly associated with disagreement that they should be used for the care of patients with antibiotic-resistant bacteria ( $P < 0.0001$ ), but this association was not present for gloves as a result of the low number of respondents that held this opinion. Comparison of agreement with gown and glove use is found in Table 4; there was significantly more support for glove use than gowns ( $P < 0.0001$ ). Differences in agreement between glove

**Table 1.** Self-reported characteristics of survey respondents

Characteristic	
Age, median (IQR) n = 168	44 (33, 54)
Role, n (%) n = 232	
Provider (physicians and advanced practice providers)	39 (17%)
Nurse and Patient Care Technician	100 (43%)
Patient Care & Rehabilitation Services (PT/OT/RT)	15 (6%)
Other	78 (34%)
Healthcare Work Experience n = 232	
Less than Five Years	29 (12%)
Five to Ten Years	58 (25%)
Ten to Twenty Years	67 (29%)
Greater than Twenty Years	78 (34%)

**Table 2.** Proportion of respondents agreeing or strongly agreeing with select survey policy questions

Survey question	Respondents in agreement, n (%)
Universal masking in patient care areas in 2023	142 (55%)
Universal masking in patient care areas early in the COVID-19 pandemic before vaccines	216 (84%)
Use of gowns when caring for patients with antibiotic-resistant bacteria	184 (75%)
Use of gloves when caring for patients with antibiotic-resistant bacteria	222 (90%)

**Table 3.** Sentiments about mask use when working in patient care areas

Survey question	Respondents in agreement, n (%)
Masks help protect me	179 (70%)
Masks help protect those around me	185 (72%)
A mask is annoying to wear while at work	105 (41%)
Wearing a mask impedes ability to perform work	35 (14%)

**Table 4.** Comparison of agreement for use of gowns and gloves to care for patients with antibiotic-resistant bacteria

	Agree with use of gloves for patients with antibiotic-resistant bacteria, n = 247	
	No	Yes
Agree with use of gowns for patients with antibiotic-resistant bacteria, n = 247	No	24 (10%)
	Yes	49 (20%)
		11 (5%)
		173 (70%)

$P < 0.0001$  by McNemar's test.

and gown use were observed in all hospital roles except for patient care and rehabilitation services, from which there were not enough responses to perform analysis. There was a statistically significant positive correlation between level of agreement with a universal masking policy in 2023, a universal masking policy in the pre-vaccine period of the pandemic, and with both gown and glove use for patients with antibiotic-resistant bacteria (Table 5).

## Discussion

Our survey of HCWs' attitudes towards universal mask use and transmission-based precautions with glove and gown use, found that the majority of HCWs are in favor of PPE to prevent the transmission of pathogens in the healthcare setting, however support is not uniform across PPE type and attitudes have shifted during the course of the COVID-19 pandemic. Agreement with universal mask policy decreased from 84% early in the pandemic when vaccines were not available to 55% in 2023, and 90% of HCWs agreed with the use of gloves when caring for patients with antibiotic-resistant bacteria compared to 75% agreement with the use of gowns. Masks are valued by HCW for the protection they provide, but most respondents expressed some level of annoyance wearing them, and for a multitude of reasons. Some HCWs were broadly opposed to universal mask policies as well as gown and glove use for transmission-based precautions. As evidenced by correlation at the individual respondent level across different policy questions, there are may be more fundamental drivers of support for or against transmission-based precautions that impact their perceived value by HCWs.

Mask use during the COVID-19 pandemic has been a controversial topic both among hospital epidemiologists, HCWs, and the general public.<sup>12,13</sup> Along with the debate about the optimal mask to prevent SARS-CoV-2 transmission, there is uncertainty about the appropriate timing for healthcare facilities to transition in and out of universal masking policies.<sup>4,14-16</sup> In their review, Landelle, et al.<sup>4</sup> discussed issues to be weighed when considering the de-escalation of universal masking policies including community prevalence of different respiratory viruses and outcomes of virus acquisition among patients and HCWs. Importantly, they acknowledge that adherence and compliance with masking should also be taken into account, as well as the physical discomfort and the potential negative impact that masking has on provider-patient relationships. Various experts and thought leaders have put forth contrasting viewpoints of the value and impact of universal masking at this stage of the pandemic, however, missing from these discussions are the contemporary opinions of front line health care workers.<sup>3,17</sup> To our knowledge, our study is the first survey to assess HCWs' attitudes towards mask use early in the pandemic and evaluate how these attitudes have changed over time. Our survey findings echo many of the discussion points raised by others: HCWs valued the sense of self-protection that masks provide them but there are tradeoffs to their use including discomfort and challenges with workplace communication. The latter is an oft-cited counterargument to broad use of masking as disease outcomes improve and prevalence declines, and our survey provides additional validation of that claim.<sup>3,18</sup>

Contact precautions with gowns and gloves are routinely used for the care of patients with antibiotic-resistant bacteria, though their value is more uncertain for endemic Methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant Enterococci (VRE).<sup>19-22</sup> To our knowledge, no studies have been

**Table 5.** Correlation of responses to agreement with policies for the use of personal protective equipment

Policy	Universal masking in patient care areas in 2023	Universal masking in patient care areas in early COVID-19 pandemic	Use of gowns for patients with antibiotic-resistant bacteria	Use of gloves for patients with antibiotic-resistant bacteria
Universal masking in patient care areas in 2023	1.00	0.47	0.43	0.22
Universal masking in patient care areas in early COVID-19 pandemic		1.00	0.20	0.27
Use of gowns for patients with antibiotic-resistant bacteria			1.00	0.33
Use of gloves for patients with antibiotic-resistant bacteria				1.00

All Pearson correlations are significantly different from 0 ( $P < 0.0014$ ).

done during the pandemic to assess HCW attitudes towards the use of glove and gowns for antibiotic-resistant bacteria, and very little data exist at all.<sup>23</sup> Many authors outline the annoyance of donning and doffing gloves and gowns, but there are limited studies outlining US HCWs' attitudes towards contact precautions, and none that we identified following the onset of the COVID-19 pandemic.<sup>21–25</sup> Some studies have suggested that compliance with glove and gown use has been shown to decrease with increasing use of contact precautions, however, a 20 intensive care unit randomized trial comparing universal glove and gown use to glove and gown use for 10% of patients showed no difference in adherence.<sup>23,26,27</sup> In our survey, we found lower acceptance of gown use compared to gloves. Similar to considerations around universal masking, it is important for hospital epidemiologists, infection prevention programs, and others who develop PPE policies to consider the tradeoffs of a policy, balancing patient safety with any additional burden of work and acceptance by bedside staff. In particular, nurses and patient care technicians bear the greatest burden of work for donning and doffing during the course of routine patient care and notably expressed the lowest level of agreement with gown use in our survey.<sup>28</sup> Acknowledging current challenges with PPE compliance, further investigation into technology innovations such as antimicrobial impregnated fabrics could improve infection prevention without adding effort to the physical demands of patient care.<sup>29,30</sup>

The limitations of this study include that it was performed at a single academic medical center. Despite numerous efforts to increase survey response rates, the survey response rate was still low. There are approximately 13,000 employees and staff at UMMC, however eligibility for the survey by having contact with patients as part of one's role was self-reported, and the subset of staff who meet this criterion is not a defined quantity. Thus, we do not know whether HCWs who responded were representative of the entire eligible workforce. In addition, our survey did not inquire about attitudes regarding gown and glove use as they pertain to specific antibiotic-resistant bacteria (eg, MRSA), however it was intended for a multi-disciplinary audience including non-clinical staff members without expertise to discern the value of PPE for different pathogens. The timing of survey distribution was a strength of this study as it was administered immediately after a policy shift to de-implement universal masking, which allowed information to be gained about HCWs changes in attitudes towards universal mask use early in the pandemic versus late in the pandemic. It also must be acknowledged that the responses captured in this study regarding agreement with

universal masking early in the pandemic are retrospective. Another important strength of our survey was our broad inclusion criteria, with responses from a large array of professional disciplines. The viewpoints of non-provider and non-nursing roles are often underrepresented and comprised 40% of our respondents with self-reported demographics. As indicated, despite the study being a single center study it is unique in assessing HCW attitudes towards different forms of PPE.

In conclusion, most HCWs are favorable towards mask use, glove use, and gown use for the prevention of pathogen transmission. However, some HCWs were not in favor of gown, glove, or mask use for patient care; these opinions appear to be driven by annoyance, impediment to work, or a combination of reasons including those not explored in this survey. More work is needed to help remedy the barriers towards the acceptability of these forms of PPE especially in light of the current HCW shortages in the United States and rising incidence of multi-drug resistant pathogens. More work is needed in the field of implementation science to educate HCWs and patients on the data supporting or refuting the use of precautions and other infection control interventions, and acknowledgement of the impact of different infection prevention strategies including the opportunity costs of time and effort, as well as contributions to fatigue and burnout.<sup>31,32</sup> As the science of transmission continues to evolve, we need to continue to assess HCW and patient attitudes towards transmission.

**Supplementary material.** The supplementary material for this article can be found at <https://doi.org/10.1017/ice.2024.157>.

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**Competing interests.** None.

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