

## Adherence to Face Mask Guidelines Among Polish Healthcare Professionals During the COVID-19 Pandemic: Are We Doing Enough?

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### Abstract

During the COVID-19 pandemic, personal protective measures such as face masks are considered crucial for reducing infection risk among both the healthcare workers and general population (HCWs), provided they are used correctly. This study aimed to evaluate whether Polish HCWs follow the 2020 World Health Organization (WHO) guidelines for proper mask use. A cross-sectional survey was conducted, with 1,156 participants responding to an online questionnaire assessing mask-related behaviors. Only 1.4% of respondents fully adhered to all WHO criteria, regardless of their medical profession, specialty, or workplace setting. Compliance was highest for criterion 1 (C1: properly covering the nose and mouth with the mask; 90.8%), criterion 4 (C4: washing or disinfecting hands after touching or removing the mask; 49%), and criterion 3 (C3: removing the mask without touching its front surface; 43.4%), whereas criterion 2 (C2: avoiding touching the mask with hands) had the lowest adherence at 6.8%. Healthcare workers experiencing mask-induced itch (31.6%) were less likely to follow C2 (odds ratio 0.53;  $p = 0.01$ ). These findings indicate that full adherence to the 2020 WHO mask guidelines is rare among Polish HCWs, and compliance with individual recommendations varies, potentially influenced by skin-related issues and other factors. Improving adherence in the future is essential to enhance HCW safety and reduce SARS-CoV-2 transmission.

**Keywords:** COVID-19, Face masks, Healthcare workers, World Health Organization

### Introduction

The COVID-19 pandemic has placed healthcare systems across the globe under unprecedented strain. By 21 December 2020, over 75 million cases had been confirmed worldwide [1], with 1.2 million reported in Poland. The seriousness of the situation is reflected in the mortality figures, exceeding 1.6 million globally and 26,000 in Poland. In response, the Polish government introduced mandatory protective measures, including maintaining a physical distance of 1.5 meters and wearing masks in public spaces [2]. These rules extend to streets, public transport, shopping centers, workplaces,

and healthcare facilities, with hand disinfection required upon entering public buildings, particularly medical institutions.

Although vaccination efforts against SARS-CoV-2 are expanding [3], adherence to personal protective practices remains critical. Since the virus is primarily transmitted through the air [4], face masks and respirators are key preventive tools, alongside hand hygiene, social distancing, and other infection control strategies emphasized by the WHO and the European Centre for Disease Prevention and Control (ECDC) [5, 6]. Evidence increasingly supports mask use as an effective means of reducing transmission in community settings [7]. This is particularly important for healthcare workers (HCWs), who face higher risks of infection than the general population [8]. Transmission to HCWs can occur not only from patients but also from interactions in community or workplace settings [9]. However, the protective effect of these measures depends on their

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correct application, as improper use may inadvertently increase infection risk [5].

Compliance with safety measures is influenced by both awareness and self-efficacy, affecting HCWs and the wider public alike [10, 11]. Research indicates that mask guideline violations among HCWs are common, both prior to and during the pandemic [12, 13]. Contributing factors include knowledge gaps, deliberate noncompliance, limited availability due to surges in demand [14], and practical difficulties such as breathing discomfort, overheating, fogging of glasses, speech impairment, or skin irritation [15, 16].

Proper mask use can be compromised at multiple stages, from hand hygiene before donning, incorrect placement, frequent touching, to improper removal. Additional problems include extended use of single-use masks, insufficient replacement, reuse of disposable masks, and improper disposal [5].

Even with extensive medical training, maintaining full adherence to safety protocols can be challenging for HCWs, especially under the dynamic conditions of the pandemic. Considering the numerous potential errors that can occur during routine procedures, this study aimed to evaluate the extent to which Polish healthcare professionals comply with international guidelines for correct face mask use in daily inpatient and outpatient practice.

## Materials and Methods

This cross-sectional investigation employed a self-designed online survey hosted on Google© Forms, targeting a diverse group of healthcare workers (HCWs) in Poland, including physicians, nurses, and other medical support staff, from both inpatient and outpatient settings. Participation was voluntary, and survey invitations were distributed individually via WhatsApp©. Following a snowball sampling method, respondents were encouraged to share the survey with their professional colleagues, thereby expanding the reach of the study [17].

The survey collected information beyond basic demographics, including participants' professional roles, self-reported sensitive skin, atopic tendencies, current facial dermatoses, and any experience of mask-related itching. Additionally, the survey featured seven questions based on the World Health Organization (WHO) recommendations for proper mask usage, as reported by Machida *et al.* [18] (**Table 1**). For each question, participants could choose from four frequency options: "always/nearly always," "rarely," "often," or "never." Adherence to a specific WHO guideline was recorded when the response was "always/nearly always."

**Table 1.** Outlines the questions designed to assess correct face mask practices according to who standards.

Criterion	Question content
C1	How frequently does your mask fully cover both your nose and mouth while at work?
C2	How often do you touch your mask during work?
C3	How frequently do you remove your mask correctly at work (avoiding contact with the front surface)?
C4	How often do you wash or disinfect your hands after removing or touching the mask at work?
C5	How frequently do you change your mask when it becomes moist at work?
C6	How often do you reuse disposable masks?
C7	How frequently do you throw away disposable masks after a single use at work?

The item addressing disinfection and hand hygiene prior to mask application, although included in the original WHO recommendations, was intentionally excluded from the questionnaire [5] to minimize potential bias. Under current Polish regulations, covering the mouth and nose is compulsory in public spaces, including streets, public transport, and workplaces. As a result, healthcare workers (HCWs) typically arrive at their place of employment already wearing face masks, which could have influenced responses to this question. Data

collection was conducted between 1 and 7 October 2020, yielding responses from 1,156 participants. Women comprised the majority of the study population (81.7%). The mean age of respondents was 40.5 years ( $\pm 11.8$ ), with ages ranging from 21 to 73 years. Considering the total number of HCWs employed in Poland [19], the sample size achieved a confidence level of 99.9%, with a margin of error of  $\pm 5\%$ . Statistical analyses were performed using Statistica 13 software (Dell, Inc., Tulsa, OK, USA). Qualitative variables were analyzed using the

chi-square test and logistic regression where appropriate. Statistical significance was defined as a p-value below 0.05. The study was carried out as part of the department's statutory research activities and complied with ethical standards approved by the Institutional Review Board.

## Results and Discussion

### Basic results

The respondents reported a mean duration of professional medical practice of  $15.0 \pm 11.8$  years, with experience ranging from 0 to 48 years. Of the 1,156 participants, 60.6% identified hospitals as their primary workplace, while 39.4% were employed mainly in outpatient care. Physicians represented the largest professional group (75.9%), followed by nurses (18.5%) and other healthcare personnel (5.6%). Most healthcare workers were employed in internal medicine departments (41.4%), with outpatient clinics accounting for 39.4% and surgical wards for 13.4%; the remaining respondents worked in anesthesiology or infectious disease units. With respect to dermatological characteristics, respondents were almost evenly divided between those reporting sensitive skin and those who did not (50.7% vs. 49.3%). A personal or familial history of atopy was reported by 37.9% of participants, while 37.4% indicated the presence of an active facial dermatosis, such as acne, seborrheic dermatitis, or atopic dermatitis. Symptoms of facial itching within the preceding week were reported by 31.6% of healthcare workers.

### Proper face mask use in the overall study population

Full adherence to all evaluated WHO criteria for correct face mask use was uncommon, observed in only 1.4% of

respondents. When individual criteria were analyzed, the highest compliance was noted for C1 (adequate coverage of the nose and mouth), C4 (hand hygiene following mask removal or contact), and C3 (removal of the mask without touching its front surface), with adherence rates of 90.8%, 49%, and 43.4%, respectively. In contrast, the lowest compliance was observed for C2 (avoiding contact with the mask during use), reported by only 6.8% of participants. Additional areas of poor adherence included C6 (avoiding reuse of disposable masks; 33.7%) and C7 (proper disposal of single-use masks after use; 35.4%).

### Proper face mask use across medical professions

Across all professional categories, full compliance with every WHO criterion was rare and did not differ significantly between groups (1.1% among physicians, 2.8% among nurses, and 0% among other healthcare workers;  $p = 0.11$ ). A similarly low level of adherence was noted for C2 across professions (7.2%, 6.5%, and 3.1%, respectively). In contrast, C1 was followed by the majority of healthcare workers regardless of professional role, although adherence varied slightly between groups (92.1% of physicians, 87.9% of nurses, and 83.1% of other personnel;  $p = 0.01$ ). Compliance with the remaining criteria did not exceed 50% in any professional category (**Table 2**). Statistically significant intergroup differences were identified for criteria C7, C6, C4, and C1. Nurses demonstrated significantly higher adherence to proper disposal of single-use masks (C7;  $p < 0.001$ ), avoidance of mask reuse (C6;  $p < 0.001$ ), and hand hygiene after mask contact or removal (C4;  $p = 0.004$ ) compared with physicians and other healthcare workers.

**Table 2.** Adherence to WHO face mask use criteria stratified by medical profession.

Category	All Healthcare Workers (n=1156)	Physicians (n=877)	Nurses (n=214)	Other Medical Staff (n=65)	Chi-Square Value	p-Value
Fully met all criteria	16 (1.4%)	10 (1.1%)	6 (2.8%)	0 (0%)	4.45	0.11
Criterion 1	1050 (90.8%)	808 (92.1%)	188 (87.9%)	54 (83.1%)	8.76	0.01
Criterion 2	79 (6.8%)	63 (7.2%)	14 (6.5%)	2 (3.1%)	1.64	0.44
Criterion 3	502 (43.4%)	373 (42.5%)	103 (48.1%)	26 (40%)	2.52	0.28
Criterion 4	567 (49%)	414 (47.2%)	126 (58.9%)	27 (41.5%)	10.93	0.004
Criterion 5	444 (38.4%)	326 (37.2%)	87 (40.7%)	31 (47.7%)	3.39	0.18
Criterion 6	389 (33.7%)	270 (30.8%)	97 (45.3%)	22 (33.8%)	16.29	<0.001
Criterion 7	409 (35.4%)	289 (33%)	100 (46.7%)	20 (30.8%)	14.92	<0.001

HCW—healthcare workers; WHO—World Health Organization.

*Proper face mask use: comparison between inpatient and outpatient settings*

Healthcare workers whose primary place of employment was a hospital most frequently complied with criterion C1 (correct coverage of the nose and mouth), followed by C4 (hand hygiene after mask contact or removal) and C3 (proper mask removal), with adherence rates of 89.4%, 46.9%, and 41.0%, respectively. A comparable pattern was observed among outpatient staff, although compliance rates were slightly higher for these criteria (93.0%, 52.4%, and 47.1%, respectively).

In both groups, adherence to all WHO criteria was rare, reported by only 1.1% of hospital-based and 1.8% of outpatient-based healthcare workers. Similarly, criterion C2 (avoiding touching the mask during use) showed low compliance in both settings (5.4% among inpatient workers and 9.0% among outpatient workers).

Overall, outpatient healthcare workers reported more consistent adherence to mask-related recommendations than their hospital-based counterparts. Statistically significant differences between the two groups were identified for most evaluated criteria, including C7, C6, C2, C3, and C1 (**Table 3**).

**Table 3.** Compliance with WHO face mask use criteria among inpatient and outpatient healthcare workers.

Criterion	All HCWs (n = 1156)	Inpatient Employees (n = 700)	Outpatient Employees (n = 456)	Chi-Square Value	p-Value
All criteria fulfilled	16 (1.4%)	8 (1.1%)	8 (1.8%)	0.76	0.38
C1	1050 (90.8%)	626 (89.4%)	424 (93.0%)	4.19	0.04
C2	79 (6.8%)	38 (5.4%)	41 (9.0%)	5.50	0.02
C3	502 (43.4%)	287 (41.0%)	215 (47.1%)	4.25	0.04
C4	567 (49.0%)	328 (46.9%)	239 (52.4%)	3.41	0.06
C5	444 (38.4%)	261 (37.3%)	183 (40.1%)	0.95	0.33
C6	389 (33.7%)	202 (28.9%)	187 (41.0%)	18.26	< 0.001
C7	409 (35.4%)	215 (30.7%)	194 (42.5%)	16.90	< 0.001

HCW—healthcare workers; WHO—World Health Organization.

*Proper face mask use according to medical specialty*

Across all medical specialties, complete adherence to every evaluated WHO criterion was uncommon. Full compliance was reported by only 0.6% of healthcare workers employed in internal medicine wards, 1.3% in surgical departments, 4.5% among anesthesiology and infectious disease specialists, and 1.8% among outpatient clinicians (**Table 4**). No statistically significant differences were identified between specialties with respect to overall compliance.

High adherence was observed for criterion C1 (appropriate coverage of the nose and mouth), although rates varied significantly between specialties (90.0% in internal medicine, 91.0% in surgery, 81.8% in anesthesiology/infectious diseases, and 93.0% in outpatient care;  $p = 0.02$ ). Compliance with criterion C4 (hand hygiene after mask contact or removal) ranged from 43.9% to 54.5% across the analyzed groups.

Significant inter-specialty differences were found for criterion C6 (avoidance of reuse of disposable masks), criterion C7 (proper disposal of single-use masks), and criterion C3 (correct mask removal technique). Adherence to C6 was lowest among internal medicine staff (26.7%) and highest among anesthesiology/infectious disease specialists (40.9%) and outpatient workers (41.0%) ( $p < 0.001$ ). Similar trends were observed for C7, with adherence rates ranging from 27.3% in internal medicine to 42.5% in outpatient settings ( $p < 0.001$ ). Criterion C3 showed significantly higher compliance among anesthesiology and infectious disease specialists (53.0%) compared with other specialties ( $p = 0.03$ ). Overall, healthcare workers in internal medicine departments demonstrated the lowest adherence rates across several WHO criteria.

**Table 4.** Compliance with WHO face mask use criteria among healthcare workers across different medical specialties.

Criterion	All HCWs (n = 1156)	Internal Diseases Ward (n = 479)	Surgery Ward (n = 155)	Anesthesiology and Infectious Diseases Ward (n = 66)	Outpatient Employees (n = 456)	Chi-Square Value	p-Value
All criteria fulfilled	16 (1.4%)	3 (0.6%)	2 (1.3%)	3 (4.5%)	8 (1.8%)	6.97	p = 0.06
C1	1050 (90.8%)	431 (90%)	141 (91%)	54 (81.8%)	424 (93%)	9.39	p = 0.02
C2	79 (6.8%)	25 (5.2%)	9 (5.8%)	4 (6.1%)	41 (9%)	5.61	p = 0.13
C3	502 (43.4%)	189 (39.5%)	63 (40.6%)	35 (53%)	215 (47.1%)	8.61	p = 0.03
C4	567 (49%)	224 (46.8%)	68 (43.9%)	36 (54.5%)	239 (52.4%)	5.53	p = 0.14
C5	444 (38.4%)	168 (35.1%)	65 (41.9%)	28 (42.4%)	183 (40.1%)	4.10	p = 0.25
C6	389 (33.7%)	128 (26.7%)	47 (30.3%)	27 (40.9%)	187 (41%)	23.68	p < 0.001
C7	409 (35.4%)	131 (27.3%)	58 (37.4%)	26 (39.4%)	194 (42.5%)	24.50	p < 0.001

HCW—Healthcare workers; WHO—World Health Organization.

#### Face mask practices and skin issues

Even among healthcare workers dealing with skin problems, full adherence to all WHO guidelines was rare, achieved by just 1.2–1.6% (**Table 5**). Most participants followed guideline C1, including 91.8% of those with sensitive skin, 91.3% with a history of atopy, 91.2% with current facial skin disease, and 89.6% who had itching caused by masks. In every skin-affected group, at least half also met guideline C4.

Experiencing itch from masks made workers less likely to meet C2 (odds ratio 0.53; p=0.01), but increased the chances of following C6 (odds ratio 1.354; p=0.01) and C7 (odds ratio 1.315; p=0.02). Those who described their skin as sensitive tended to perform better on several guidelines: C3 (odds ratio 1.394; p=0.003), C4 (odds ratio 1.508; p<0.001), C6 (odds ratio 1.471; p=0.001), and C7 (odds ratio 1.288; p=0.02) (**Table 6**).

**Table 5.** Rates of adherence to WHO mask-wearing criteria by type of skin condition.

Criterion	Atopy (n = 438)	Sensitive Skin (n = 586)	Mask-Related Pruritus (n = 365)	Pre-Existing Skin Condition (n = 433)
Met all criteria	7 (1.6%)	7 (1.2%)	5 (1.4%)	6 (1.4%)
C1	400 (91.3%)	538 (91.8%)	327 (89.6%)	395 (91.2%)
C2	27 (6.2%)	43 (7.3%)	16 (4.4%)	27 (6.2%)
C3	205 (46.8%)	278 (47.4%)	155 (42.5%)	197 (45.5%)
C4	231 (52.7%)	317 (54.1%)	185 (50.7%)	221 (51.0%)
C5	171 (39.0%)	230 (39.2%)	138 (37.8%)	153 (35.3%)
C6	144 (32.9%)	222 (37.9%)	140 (38.4%)	152 (35.1%)
C7	158 (36.1%)	224 (38.2%)	145 (39.7%)	162 (37.4%)

WHO—World Health Organization.

**Table 6.** Logistic regression analysis evaluating the association between skin-related conditions and adherence to WHO face mask use criteria.

Criterion	Atopy (n=438)	Sensitive Skin (n=586)	Face Mask-Induced Itch (n=365)	Facial Dermatitis (n=433)
All criteria fulfilled	OR 1.28 95% CI (0.473–3.460) p = 0.31	OR 0.754 95% CI (0.279–2.037) p = 0.29	OR 0.985 95% CI (0.340–2.855) p = 0.49	OR 1.00 95% CI (0.362–2.776) p = 0.004
C1	OR 1.101 95% CI (0.726–1.669) p = 0.32	OR 1.270 95% CI (0.850–1.896) p = 0.121	OR 0.809 95% CI (0.533–1.229) p = 0.16	OR 1.08 95% CI (0.712–1.636) p = 0.36

C2	OR 0.841 95% CI (0.52–1.361) p = 0.7	OR 1.175 95% CI (0.743–1.858) p = 0.69	OR 0.53 95% CI (0.302–0.931) p = 0.01	OR 0.858 95% CI (0.53–1.388) p = 0.27
C3	OR 1.247 95% CI (0.982–1.584) p = 0.04	OR 1.394 95% CI (1.104–1.761) p = 0.003	OR 0.944 95% CI (0.735–1.213) p = 0.33	OR 1.144 95% CI (0.9–1.454) p = 0.14
C4	OR 1.269 95% CI (1.0–1.61) p = 0.03	OR 1.508 95% CI (1.196–1.902) p < 0.001	OR 0.945 95% CI (0.738–1.212) p = 0.44	OR 1.136 95% CI (0.895–1.442) p = 0.15
C5	OR 1.044 95% CI (0.818–1.333) p = 0.36	OR 1.075 95% CI (0.848–1.362) p = 0.28	OR 0.964 95% CI (0.746–1.244) p = 0.39	OR 0.811 95% CI (0.634–1.038) p = 0.048
C6	OR 0.719 95% CI (0.543–0.951) p = 0.01	OR 1.471 95% CI (1.151–1.882) p = 0.001	OR 1.354 95% CI (1.045–1.755) p = 0.01	OR 1.109 95% CI (0.863–1.426) p = 0.209
C7	OR 1.050 95% CI (0.819–1.346) p = 0.35	OR 1.288 95% CI (1.011–1.064) p = 0.02	OR 1.315 95% CI (1.018–1.700) p = 0.02	OR 1.119 95% CI (0.874–1.434) p = 0.19

WHO—World Health Organization.

According to the World Health Organization, the use of face masks represents a key element of protective strategies against SARS-CoV-2 transmission in both healthcare settings and the general population [5]. In a recent large-scale survey conducted in Japan, mask-related behaviors were assessed among more than 2,000 members of the general public during the COVID-19 pandemic, revealing that only 23.1% complied with all WHO-recommended practices [18]. Because correct mask use is essential for achieving optimal protective effects, it might reasonably be expected that healthcare workers (HCWs) would demonstrate higher levels of adherence than the general population. This expectation is particularly relevant not only for infection prevention but also for maintaining professional standards and serving as role models for patients [20].

Nevertheless, existing literature suggests that difficulties with proper mask use among HCWs are not a new phenomenon. Even prior to the COVID-19 pandemic, compliance with face mask guidelines was frequently suboptimal. For instance, Herron *et al.* reported in 2019 that only 18% of 1,034 surgically scrubbed HCWs fully followed Centers for Disease Control and Prevention (CDC) recommendations regarding face mask usage [12]. The authors hypothesized that such improper practices may have contributed to the occurrence of surgical site infections over time.

To our knowledge, the present study represents the largest cohort of HCWs evaluated specifically for face mask-related behaviors during the COVID-19 pandemic. Our findings clearly demonstrate that full compliance

with WHO mask-use recommendations was exceptionally rare, regardless of professional role, medical specialty, or work environment. The novelty of this investigation lies in the inclusion of a large, diverse group of HCWs and the application of strict international criteria to assess their daily mask-use practices. While the WHO guidelines are clear and practical, maintaining consistent adherence to every recommendation appears to be challenging in real-world clinical settings.

Interestingly, HCWs in our cohort reported lower full compliance rates than those observed in the Japanese general population study (1.4% vs. 23.1%) [18]. However, this discrepancy should be interpreted cautiously, as Machida *et al.* classified respondents as compliant when they answered either “always” or “sometimes,” whereas our analysis applied more stringent criteria by accepting only consistent adherence. Given the professional training, experience, and frontline role of HCWs during the COVID-19 pandemic, it seems reasonable to expect stricter compliance with protective measures compared with the general population. At the same time, cultural factors must be acknowledged, as routine face mask use has long been socially accepted in Japan [18]. Despite these contextual differences and methodological limitations, our results remain concerning. Moreover, the self-reported nature of the data may have led to overestimation of compliance, suggesting that actual adherence levels could be even lower.

Previous studies highlight discrepancies between perceived knowledge and actual practice. For example,

Kumar *et al.* found that although 88.2% of Pakistani HCWs expressed confidence in their knowledge of proper mask use, only 35.2% demonstrated good procedural performance [13]. Similarly, Supehia *et al.* observed that 64.1% of Indian HCWs wore masks correctly during a four-week observation period, as assessed by external observers using a WHO-based checklist, though detailed compliance with individual criteria was not reported [21].

In our study, the highest compliance was observed for proper coverage of the nose and mouth (C1; 90.8%) and hand hygiene following mask contact or removal (C4; 49%), with consistent patterns across most subgroups. Physicians reported higher adherence to C1 compared with nurses and other medical staff ( $p = 0.01$ ). Conversely, nurses more frequently followed hand hygiene practices (C4) and recommendations related to single-use mask disposal and non-reuse (C6 and C7) ( $p = 0.004$ ). These profession-related differences are difficult to explain conclusively. HCWs working in outpatient settings demonstrated better adherence to several criteria (C1, C2, C3, C6, and C7) than those employed in hospitals, possibly due to a workflow that allows more time for careful adherence between patient encounters. On the other hand, outpatient care often involves a high volume of patients, requiring repeated performance of protective procedures.

Variability in compliance with certain criteria, particularly those related to mask reuse and disposal (C6 and C7) and hand hygiene (C4), may also reflect periodic shortages of personal protective equipment or disinfectants during the pandemic [14, 22]. These constraints may partially explain the low overall compliance observed in our cohort and argue against interpreting non-adherence as intentional negligence. Among anesthesiology and infectious disease specialists, adherence to C1 was unexpectedly lower than in other specialties ( $p = 0.02$ ). The nature of their work—often involving urgent, high-mobility procedures such as intubation—may hinder consistent mask positioning. Paradoxically, given their high exposure risk, stricter adherence would be expected, making this finding particularly noteworthy.

Across all analyzed subgroups, avoidance of touching the face mask (C2) emerged as the most problematic behavior, with more than 90% of HCWs acknowledging non-compliance. Mask-induced itch, reported by 31.6% of participants, was significantly associated with lower adherence to this criterion. Itching creates an urge to

scratch, which—even when resisted—may result in repeated mask adjustments and increased risk of self-contamination [5, 16]. Prolonged mask wearing has previously been identified as a risk factor for itch development, particularly when masks are worn for more than five hours [16]. Given their occupational responsibilities, HCWs are especially prone to extended mask use, thereby increasing the likelihood of itch and subsequent mask touching. Additional contributing factors may include discomfort, exacerbation of acne, occupational contact dermatitis, seborrheic dermatitis, or rosacea [23–26].

Notably, some studies have suggested that mask wearing may reduce face-touching behavior in both the general population [27, 28] and HCWs [29]. The prevalence of sensitive skin, acne, and atopic predisposition reported in our cohort aligns with existing epidemiological data [30–32], indicating that our population is representative in this regard.

Although WHO face mask recommendations are straightforward and practical, their simplicity does not guarantee consistent implementation in clinical practice. Whether non-adherence stems from insufficient awareness or from other organizational, psychological, or environmental factors remains unclear. Regardless, our findings underscore the need for targeted educational interventions for HCWs, including regular training sessions focused on proper mask use. Supplementary educational tools, such as infographics and instructional videos available online, may further enhance compliance [33], particularly if disseminated more effectively through channels such as social media.

This study has several limitations. Its cross-sectional, online design relies on self-reported data, which may be influenced by recall bias or social desirability, especially among HCWs reluctant to acknowledge non-compliance. Future research should incorporate objective assessments conducted by external observers over extended periods. Additionally, given evidence that older age is associated with lower perceived stress during the COVID-19 pandemic [34, 35], it would be valuable to explore whether age-related factors influence adherence to protective measures among HCWs.

Another limitation is the inability to calculate an accurate response rate due to the adopted methodology, although similar approaches have been widely accepted in prior research [36, 37]. We also did not differentiate between types of face masks used; some HCWs may have disinfected reusable masks after single use, potentially

affecting compliance with criteria related to disposal and reuse. The relatively small number of anesthesiology and infectious disease specialists further limits the interpretation of specialty-specific findings. Consequently, differences observed between medical fields should be interpreted cautiously.

Finally, our results pertain specifically to Polish HCWs and may not be generalizable to other countries, particularly those outside Europe. The lack of pre-pandemic data on mask-use behaviors in Poland—both among HCWs and the general population—also prevents comparisons with baseline practices prior to COVID-19.

### Conclusion

Healthcare workers (HCWs) frequently fail to meet the examination standards when evaluated against the full set of WHO criteria for the safe use of face masks. Nevertheless, achieving consistent and unwavering adherence to all these criteria remains a significant ongoing challenge in routine clinical practice. Compliance with individual criteria varies considerably, and this variability can sometimes be influenced by factors beyond the control of HCWs. The findings of our study strongly indicate an ongoing requirement for targeted educational initiatives aimed at HCWs, along with efforts to broaden their societal impact, to improve alignment with WHO guidelines. Recognizing these deficiencies represents an essential first step toward enhancing compliance with established standards, which in turn promotes workplace safety and may help lower the risk of HCWs themselves becoming infected patients.

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