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Review Article

Mask Usage in Healthcare Settings: Is It the Right Time for Easing Restrictions? A Narrative Review

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Abstract

Since the onset of the coronavirus disease 2019 (COVID-19) pandemic, personal protective equipment, particularly face masks, has been central to infection control and reducing associated mortality. Global mask mandates, combined with widespread vaccination, helped curb peak pandemic phases. In 2023, the WHO reclassified COVID-19 as an ongoing health priority rather than an emergency, prompting reassessment of mask policies in healthcare settings. Yet, hospitals remain high-risk, especially with the concurrent "triple epidemic" of COVID-19, influenza, and respiratory syncytial virus. This review summarizes current evidence on mask efficacy, adherence, and policy changes to determine whether, when, and under what conditions mask use can be safely eased in clinical settings.

Keywords: COVID-19; Mask; Personal protective equipment; Healthcare setting; Hospital

Introduction

The coronavirus disease 2019 (COVID-19) pandemic, declared a major global health issue in early 2020, has critically impacted medical settings. Close human-to-human contact is the primary mode of disease transmission (1), highlighting the need for effective protective behaviors. During the pandemic, governments worldwide mandated personal protective equipment (PPE), particularly masks, as a key containment measure. However, wearing facial masks quickly became controversial, with varying adherence between and within nations due to cultural factors and differing perceptions of its efficacy (2, 3). Efficacy debates were influenced by mask type, quality, and use, but correct wearing, characterized by covering both nose and mouth, remains an established

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preventive measure against spreading the virus (4). The protective role of masks is more prominent in healthcare units, where both patients and medical workers are covered. However, the infection risk is often greater during community activities among healthcare staff (5). These results altogether emphasize the importance of wearing masks.

By late 2021, the development of effective vaccines combined with mask use had markedly reduced the COVID-19 burden (6). In May 2021, the Centers for Disease Control and Prevention (CDC) stated that fully vaccinated people could forgo masks indoors (7). Currently, despite considerable progress in global vaccination coverage, global immunity remains incomplete: a significant portion of the world population declines booster doses. Moreover, constant viral mutations make the available vaccines less efficient (8).

In May 2023, WHO reclassified COVID-19 as an ongoing concern rather than an emergency (9). Although the COVID-19 public health emergency has come to an end and public mask adherence has weakened, it is still challenging to answer whether to use masks or not in healthcare settings. Nowadays, healthcare policy remains debated, especially during seasonal surges of influenza, COVID-19, and respiratory syncytial virus (RSV), called the "triple epidemic" (10). The last WHO guidelines released in Jan 2023 still advise masks in crowded, enclosed, or poorly ventilated spaces (11). However, these overlapping outbreaks have renewed discussions on whether universal masking in healthcare is still necessary or should evolve into targeted, setting-specific measures. This review examines recent evidence and international recommendations to assess the continuing role of masks in healthcare and the circumstances under which restrictions may be eased.

The impact of mask use on the spread of respiratory viruses

As mentioned earlier, airborne particles containing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) are the primary route of COVID-19 transmission (12). Similarly, respiratory infections such as influenza and RSV spread mainly through aerosols and droplets generated during talking, coughing, or sneezing. This makes barrier methods essential (4). Among these, masks significantly limit viral spread via respiratory droplets.

Extensive epidemiological and experimental evidence support mask effectiveness in reducing respiratory virus transmission. A cohort study in China during early COVID-19 demonstrated that consistent household mask uses markedly reduced secondary infections, especially when started before symptom onset (13). Similar trends were documented during the 2003 severe acute respiratory syndrome (SARS) outbreak; routine clinical mask use cut virus transmission by up to 70% (14). Additionally, in influenza outbreaks, surgical masks filtered about 90% of viral aerosols (15). Laboratory studies confirm that cloth, surgical, and N95 masks provide substantial protection, particularly when worn by infected individuals (16). A case-control study in Thailand with 211 COVID-19 cases and 839 controls found consistent risk reduction with mask use, though mask type was not emphasized (17).

In addition to various investigations, the WHO guidelines strongly recommend multi-layer masks, particularly in communities, home care for patients, and healthcare settings (18). Transmission risk is also highest indoors and in crowded spaces. Overall, diverse evidence from observational studies, randomized trials, and mechanistic experiments identifies masks as a critical measure against respiratory viruses, especially in healthcare environments with high viral loads and vulnerable patients.

General belief and governmental policies are associated with the mask adherence

Public perceptions and social beliefs surrounding mask effectiveness have played a pivotal role in shaping adherence behaviors throughout the COVID-19 pandemic. Beyond public policies and mandates, social factors substantially influence mask-wearing behaviors.

Age, gender, educational level, urbanicity, and employment status are key determinants. Higher

education is consistently associated with better adherence, while financial hardship and unstable employment correlate with lower compliance. Places visited and time spent away from home also matter; mask use is high in pharmacies and grocery stores but lower at social events, cafés, or restaurants (19). During the influenza outbreak, younger adults were less willing to use masks than older individuals (20). In terms of gender, women generally report higher adherence than men, reflecting greater attention to health issues (19). Mask-wearing behaviors have also been investigated from a less conventional perspective. A U.S. survey of 1,050 participants found that strong belief in science correlated with higher perceived mask efficacy and greater adherence (21). Similarly, a U.K. study with 908 participants showed that feeling comfortable and confident while wearing masks increased compliance, whereas negative social perceptions reduced it (22).

At the macro level, government policy strongly influences adherence to mask-wearing, especially in public places. Mandatory rules significantly increase community mask use, subsequently lowering COVID-19 cases and mortality (23). A study on mask mandate policies evaluated the change in the COVID-19 infection rate across different counties in the state of Kansas, United States. Infection rates dropped in counties with implemented mask or other face-covering mandates, but continued to rise in those without (24).

In the post-emergency phase of COVID-19, formal mandates have relaxed in many areas, but voluntary use continues in healthcare settings and among high-risk individuals, often influenced by institutional norms, peer behaviors, and periodic public health advisories (25).

Taken together, mask-wearing is not merely a matter of access or education. It depends on public beliefs, cultural norms, and policy enforcement. Providing clear evidence of masks' role in reducing morbidity and mortality, alongside mandate policies, may improve acceptance. These two factors also justify the differences in mask usage rates between countries.

Different types of face masks

The use of masks to cover the nose and mouth as protection against infectious diseases dates back to early modern Europe. In 1897, the Polish surgeon Mikulicz pioneered the use of masks. He defined a mask as a piece of gauze securely fastened to a hat with two strings, effectively covering the face and nose, thus serving as an effective barrier against germs (26). Additionally, during the 1918–1919 Spanish Influenza epidemic, masks became widely used, especially among healthcare workers. In several cities of the United States, this practice became mandatory (27).

Medical masks constitute a crucial category of PPE designed to limit respiratory viruses spread. Throughout the COVID-19 pandemic, three main mask types were used (Fig. 1):

Fig. 1: The three primary types of masks used during the pandemic: (a) cloth mask, (b) surgical mask, (c) respiratory mask (N95) (30)

1. **Cloth Masks:** Made from various textiles and provide a basic level of protection for wearers and those nearby (28).
2. **Surgical Masks:** Common in healthcare settings, these offer intermediate protection and are essential for both healthcare professionals and the general public (29).
3. **Respiratory Masks (N95):** Known for high filtration efficiency, N95 respirators are critical for frontline healthcare workers, providing strong protection against airborne particles and viruses (29).

Combining cloth masks with social distancing is recommended as an effective strategy. Cloth masks, made from various fabrics, can reduce exposure to aerosol particles, with filtration depending on fabric type, density, and layering (31). They also resist liquids and shield against larger respiratory droplets (32). Advantages include affordability, availability, and reusability, making them popular during COVID-19. However, cloth masks have a particle penetration rate about 97% higher than medical masks, providing less protection than surgical or N95 masks (31). Nonetheless, they can still help reduce transmission in community settings.

Surgical masks, also known as medical masks, typically have three layers: an outer water-repellent layer, a middle filter, and an absorbent inner layer. They primarily block droplets released by coughing and sneezing (31, 33) and, with their loose fit feature, help reduce frequent hand-to-face contact (33). Correct orientation, with the colored side outward, is important (31). Studies highlight the protective value of medical masks, showing 70%–79% reductions in COVID-19 infection rates across various environments (34). However, prolonged usage may lead to side effects such as dry mouth, unpleasant breath, lower blood oxygen saturation, headaches, and fatigue (35).

N95 masks filter 95% of particles as small as 0.3 microns by an impressive 95% (36). These masks are designed for an airtight seal, minimizing any potential leakage around the face, and are highly efficient at filtering up to 95% of airborne particles. N95 masks are essential for preventing diseases such as tuberculosis, chickenpox, and measles (33, 34, 37). They also offer superior protection during high-risk procedures such as bronchoscopy, CPR, and intubation (37, 38). Wearing an N95 near an unmasked infected person can delay infectious dose transmission to 1.25 h, versus 15 min with no masks (36). However, N95 masks may cause increased fatigue and thirst among healthcare workers. Furthermore, compared to surgical masks, N95 masks may elevate facial skin temperature and, in some cases, lead to skin irritation (34, 39). Overall, N95, surgical, and cloth masks reduce infection risk by 83%, 66%, and 56%, respectively (40).

Regarding single versus double masking, studies show double masking can increase filtration by up to 500%. Pairing a three-layer mask with a fabric mask can approach N95-level protection, while wearing a surgical mask with an N95 creates an especially strong barrier (36-39).

Optimizing mask effectiveness through proper use and avoiding common errors

Proper mask usage involves more than simply wearing a face covering. Masks must cover both nose and mouth securely. However, there is a crucial yet often overlooked step before using masks: hand hygiene, either washing your hands with soap for at least 20 sec or using a hand sanitizer containing at least 60% alcohol (33).

For cloth masks, full coverage from nose to chin is essential, secured by ear loops or ties, and they should be washed after each use. Surgical masks must be worn with the white side inward and the metal nose strip on top. N95 respirators require a fit check to ensure an airtight seal, with head straps placed above and below the ears for stability and pressure distribution. Key removal practices include avoiding touching the front, detaching only by the straps, and discarding or laundering immediately. Reuse of single-use surgical or N95 masks without decontamination is discouraged. Despite widespread training, misuse remains common, including wearing masks below the nose, touching the outer surface, and inverting masks (colored side inward), even among

healthcare workers. Table 1 summarizes correct wearing and removal protocols (41).

Table 1: Summary of proper use and removal guidelines for cloth, surgical, and N95 masks

	Type of masks		
	Cloth mask	Surgical mask	N95
How to wear	1) Wash or disinfect hands 2) Cover nose and mouth, tighten	1) Wash or disinfect hands 2) Cover from nose to chin 3) White side inward 4) Metal strip upward, press on the nose	1) Wash or disinfect hands 2) Use the correct size 3) Place from nose to chin 4) Straps behind head, one above ear, one below
How to remove	1) Use ear loops or a head strap 2) Fold outer corners 3) Discard if wet/dirty 4) Wash and dry before storage	1) Use head straps to remove 2) Discard after use	1) Pull lower strap, then upper; avoid touching front 2) Discard if used in medical settings

Mask adherence after COVID-19 vaccination

COVID-19 vaccines provide strong protection, particularly against severe illness and hospitalization. However, coverage in some regions remains inadequate, and resistance to booster doses has lowered community immunity as we passed the fifth anniversary of COVID-19's emergence. Still, the combination of vaccination and mask-wearing remains a vital strategy for controlling the pandemic (41). A recent California healthcare facility study found that reduced mask use lowered vaccination effectiveness from 94% to 66% (41).

Despite the proven benefits of combining masks with vaccines, several studies report declining mask use after vaccination. For instance, among 3,229 university students in China, adherence fell by 22% following vaccination (42). In South Korea, increased cases post-vaccination were linked to lapses in preventive measures, prompting recommendations for continued mask use even after being vaccinated (43). Overall, the decline in mask usage after vaccination, often due to overconfidence in immunity, has been observed globally. As of 2025, layered protection with vaccines and masks remains among the most effective strategies to limit transmission amid fluctuating viral patterns and inconsistent immunity.

The last recommendation regarding masks: Is it time to remove them?

Since the onset of COVID-19, debates over mask mandates and other control measures have persisted, with strong evidence linking mask use to reduced SARS-CoV-2 transmission. Although COVID-19 was downgraded from a public health emergency in the United States on May 11, 2023, it remains a public health priority (44). It emphasizes the need for clear decisions on mask mandates, especially for hospital staff.

The CDC's latest update recommends mask use under specific conditions: for confirmed or suspected COVID-19 cases; for close contacts within ten days of exposure; during SARS-CoV-2 outbreaks until 14 d without new cases; when COVID-19 admissions are high, particularly in medical settings; and for healthcare workers in high-risk areas, such as emergency departments or among immunocompromised patients, during increased community transmission of COVID-19 and other respiratory viruses (45).

During the pandemic, nonpharmaceutical interventions like masks, social distancing, and stay-at-home measures reduced other respiratory viruses. Masks also block airborne pathogens beyond SARS-CoV-2 (41). Data from the 2023–2024 season showed reduced influenza burden, attributed to widespread mask use, effectively removing the concept of a seasonal flu peak. The authors rec-

ommended influenza vaccination and continued preventive measures like masks as autumn approaches (46).

Deciding whether to lift universal mask mandates, especially in healthcare, remains complex. In New York, a mandatory mask policy correlated with greater declines in COVID-19 cases and deaths than in Massachusetts, where no concurrent policy was enacted (47). Similarly, in Iowa, lifting the mandate in Feb 2021 was followed by higher case counts than in control regions (48). Moreover, following widespread global vaccination efforts, the burden of the disease was brought under control. However, challenges have arisen, including lower booster uptake, declining effectiveness against emerging variants, and waning immunity (8, 49). Notably, Omicron-targeted vaccines show reduced efficacy compared with those for Delta variant (50). A gradual lifting of mandates is therefore a cautious approach to avoid future outbreaks.

When considering the discontinuation of mandatory mask-wearing in healthcare settings, several challenges arise, particularly in hospitals that cater to individuals with weakened immune systems and elderly patients. The fact that many severe COVID-19 cases have been observed among the elderly further complicates this decision. Hospitals have higher viral loads than community settings, making mask removal even more difficult (51). Studies consistently show universal masking in healthcare reduces hospital-acquired SARS-CoV-2, even post-vaccination (52, 53). A multicenter U.S. trial found units maintaining masking had 41% fewer in-hospital infections than those that lifted mandates (54).

Mask-wearing has become routine for healthcare workers and visitors. Lui et al. reported a 28.7% increase in healthcare students' intention to wear surgical masks during patient care, even without mandates (55). However, the absence of specific data regarding healthcare settings makes the decision more complex. It remains imperative to prevent overwhelming the healthcare system and to offer enhanced protection for individuals visiting such settings. This underscores the urgency of clear masking policies (45).

In early 2025, the U.S. and several European countries faced a major winter surge of respiratory illnesses—COVID-19, influenza, and RSV (56, 57)—raising concerns about system strain and staff shortages. Fully removing mandates now could be harmful; a gradual, risk-stratified approach is advised, retaining masks in emergency rooms, oncology, geriatric care, and other high-risk units, while considering removal in low-risk areas. Policies should remain adaptive, data-driven, and context-specific as we move from emergency to sustainable infection control.

Conclusion

This review outlines the evolving role of masks from the early COVID-19 emergency to the present, when SARS-CoV-2, though no longer a global emergency, still poses risks alongside influenza and RSV. While COVID-19's burden has lessened, recent respiratory surges highlight the need for cautious, context-specific decisions on mask removal. In healthcare, with vulnerable populations and high viral loads converging, continued masking remains a practical, evidence-based safeguard, but broad mandates may not be necessary in all settings. A gradual, risk-stratified approach offers flexibility without abrupt policy shifts. Further longitudinal research is needed to establish clear epidemiological thresholds for easing mandates in healthcare settings.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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