

Review Article

Personal protective equipment usage and compliance among healthcare workers

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ABSTRACT

This review delves into personal protective equipment (PPE) usage and adherence among healthcare professionals. The research highlights the role of knowledge and awareness in shaping compliance behaviors, stressing the importance of education and training initiatives. Factors like discomfort, perceived risk, and cognitive beliefs at a level with organizational culture, leadership, and a positive safety environment impact compliance result. The benefits of using PPE range from preventing healthcare-associated infections to promoting the well-being of healthcare workers. Successful clinical management involves evidence-based policy creation, thorough education and training programs, strategic resource distribution, and ongoing assessment. Leadership and organizational culture are drivers that cultivate a safety-oriented culture and adherence to PPE protocols. Given the evolving nature of diseases, guidelines need updates alongside contingency plans for potential outbreaks or pandemics. As healthcare institutions aim to enhance compliance levels, the insights from this review offer direction for managers and policymakers by laying a foundation for improving safety standards and strengthening overall healthcare systems.

Keywords: Compliance, Healthcare workers, Infectious diseases, PPE

INTRODUCTION

Personal protective gear (PPE) plays a role in protecting the health and safety of healthcare professionals who encounter occupational risks, particularly those related to infectious diseases.¹ One significant research finding highlighted in studies is the influence of knowledge and

awareness on ensuring compliance with PPE protocols. Numerous research studies emphasize the importance of healthcare professionals understanding PPE guidelines to ensure usage. An ongoing concern highlighted in the literature is the tendency for utilization due to a lack of understanding of PPE protocols.^{2,3} This gap in knowledge underscores the necessity for education and training

initiatives to strengthen healthcare workers' comprehension of the protective aspects of PPE. The effective sharing of information emerges as a component in fostering a culture that values and embraces the significance of adhering to PPE guidelines. Moreover, research consistently links increased awareness with compliance rates among healthcare workers.^{4,5} As healthcare professionals recognize more the role PPE plays in preventing infections, there is a corresponding increase in adherence to guidelines. This emphasizes the importance of interventions aimed at raising awareness within healthcare environments and promoting a grasp of the implications of PPE use.^{1,6} In addition, beyond factors, Individual obstacles, like discomfort, perceived risk, and cognitive beliefs, significantly influence healthcare workers' decision-making process when it comes to using PPE.⁷⁻⁹ However, organizational dynamics play a role in either reinforcing or alleviating these barriers. Factors such as the atmosphere at work, access to equipment (PPE), and the influence of colleagues play significant roles in influencing people's compliance behaviors within an organization.¹⁰ Organizational culture stands out as a theme in studies highlighting its significant impact on PPE compliance. Leadership within healthcare institutions contributes to cultivating an environment that values safety and underscores the significance of adhering to PPE protocols.^{11,12} Research shows that a positive safety environment, shaped by leadership, is directly linked to compliance levels among healthcare workers. The organizational atmosphere becomes a factor in influencing the attitudes and actions of healthcare workers toward using PPE.^{13,14} Perceived risk also emerges as a factor affecting PPE compliance, supported by research findings. Research shows that healthcare professionals tend to follow equipment (PPE) guidelines more diligently when they believe there is a risk of getting infected.¹⁵ This highlights the link between risk perception and the motivation to practice measures. However, accurately assessing and communicating the level of risk to healthcare workers presents a challenge.¹⁶⁻¹⁸ Research stresses the importance of using nuanced communication strategies to convey the urgency and importance of PPE use in healthcare settings. External factors, guidelines, and regulations play a role in shaping PPE compliance behaviors among healthcare professionals. The changing landscape of threats, as seen during events like the COVID-19 pandemic, underscores the need for timely updates to guidelines. Studies have shown that healthcare workers followed the guidelines closely during the pandemic, leading to better compliance. This highlights the importance of having guidelines that can keep up with infectious threats. In about following safety protocols by wearing gear the availability and accessibility of equipment consistently stand out as key concerns highlighted in various studies. The lack of access to gear has been recognized as a major obstacle to healthcare workers adhering to safety guidelines effectively. This underscores the need for maintaining a supply chain, effective planning, and proper resource allocation to ensure a robust system for

providing protective equipment. The impact of the COVID-19 pandemic has further emphasized the importance of anticipating and addressing shortages to strengthen the frontline defense offered by gear. To sum up this examination of research on the use of gear and adherence to safety measures among healthcare workers uncovers a complex web of interconnected elements. Factors like knowledge culture, perceived risks, and external recommendations collectively influence how healthcare professionals use protective equipment. Addressing these factors is essential for enhancing compliance rates and safeguarding the well-being of healthcare workers, especially in light of evolving infectious threats. As healthcare institutions continue to confront the challenges associated with optimizing the use of gear, insights from this review provide guidance for policymakers, healthcare leaders, and educators striving to enhance protection for frontline healthcare workers. This review aims to provide an overview of PPE usage and compliance among healthcare workers.

LITERATURE RESEARCH

The usage and compliance of PPE among healthcare workers were examined. English studies from PubMed and Scopus since 2008 were reviewed, along with references from these articles, to ensure comprehensive coverage. Keywords such as PPE, healthcare workers, compliance, adherence, safety protocols, and infection control directed the search strategy.

DISCUSSION

The discussion about how healthcare workers handle PPE usage and adherence highlights the mix of factors involved in ensuring an efficient healthcare setting. Policy creation stands out as an element with researched regularly refreshed policies serving as the foundation of a strong PPE management plan. Clearly outlining PPE needs, following usage procedures, and providing guidance on equipment replacement are crucial in influencing the actions of healthcare workers. Education and training programs play a role in promoting adherence to PPE guidelines. By incorporating simulation-based training, ongoing education, and real-life scenario exercises, healthcare workers gain an understanding of why PPE is essential, equipping them with the necessary knowledge and skills for compliance. Managers are instrumental in overseeing these efforts to foster a culture of safety within the organization. The allocation of resources becomes a focus, underscoring the significance of a supply chain. Managers work closely with procurement and supply chain teams to ensure access to and distribution of PPE. Taking steps, such as identifying shortages and exploring alternative sources are key to maintaining an uninterrupted supply of protective gear. Given the evolving nature of diseases, continuous evaluation and adaptability are critical. Surveillance systems, regular assessments, and feedback mechanisms all contribute to refining PPE management strategies over

time. Managers actively involve frontline staff by addressing concerns and implementing targeted interventions to boost compliance levels.

CLINICAL MANIFESTATION

The way healthcare workers use and follow safety measures, like PPE in healthcare settings, has an impact on their well-being as individuals and as a group. The effects of PPE usage among healthcare workers, known as manifestations, are results that come from how well these protective measures are applied.^{19,20} These outcomes do not affect the healthcare workers. It also influences patient outcomes and the overall healthcare environment. In settings, the way healthcare workers use and follow safety measures like PPE plays a role in preventing infections that occur during treatment. By sticking to the protocols for wearing PPE, healthcare professionals can defend themselves against spreading germs at hospitals and clinics. The result of correct PPE use is a decrease in the number of infections, which ultimately leads to safety for patients and overall quality of healthcare. Research consistently proves that healthcare staff who follow PPE rules have infections, showing the benefits of strict compliance. One key aspect of using PPE in settings is safeguarding healthcare workers from risks related to their work, especially when it comes to diseases. Using PPE correctly acts as a shield between staff and dangerous germs, reducing the chances of exposure and getting sick. This protection is particularly important for illnesses where masks and respirators have been found to lessen the spread of particles, keeping healthcare workers safe from respiratory diseases. The result is a workforce that remains healthy enough to keep caring for patients without interruption. The influence of following PPE guidelines on well-being is an aspect of medical practice. Healthcare workers who adhere to these standards help create an environment for patients by lowering the risk of infections acquired during their hospital stay. There is a link between using protective gear and reducing the risk of infections in patients. In the effort to deliver top-notch healthcare, how well healthcare facilities stick to PPE guidelines is a sign of their dedication to keeping patients safe and preventing infections. Apart from preventing infections, following PPE protocols also impacts the emotional health of healthcare workers. When healthcare workers trust that their protective gear works effectively, it eases the stress of working in high-pressure situations like disease outbreaks. Feeling secure because of proper PPE use can be seen in stress levels, mental well-being, and increased resilience among healthcare professionals. This positive impact helps maintain a stable healthcare workforce. On the other hand, not following PPE guidelines in settings can have serious consequences. Ignoring or inconsistently using equipment raises the risk of getting exposed to germs leading to issues like infections among healthcare workers. This doesn't just affect individuals-it also poses risks for safety and the smooth functioning of healthcare systems. Outbreaks

caused by lapses in PPE use can strain resources and services and undermine overall clinical conditions. Furthermore, how well PPE is used reflects how adaptable and responsive our healthcare systems are during crises like pandemics or outbreaks.^{3,19} Sufficient readiness and education, on PPE guidelines are clearly reflected in the systems efficient response, to infectious risks. The result of this is a healthcare system that can handle increases in the number of patients, control the spread of illnesses, and safeguard both medical staff and the broader community. To sum up, the impact of using PPE and following guidelines in healthcare settings is significant and widespread. It plays a role in preventing infections within healthcare facilities, protecting healthcare workers, influencing outcomes, and enhancing the overall resilience of healthcare systems. As healthcare providers deal with the complexities of managing diseases, adhering strictly to PPE protocols emerges as an aspect of ensuring the safety, health, and welfare of both medical professionals and their patients.

MANAGEMENT

Managing the use and adherence to PPE by healthcare workers (HCWs) presents a challenge that requires a strategy to safeguard the well-being of both medical staff and patients. Effectively handling this aspect involves elements such as creating policies, providing education and training, allocating resources, and consistently assessing the situation. One of the aspects in managing the use of gear in healthcare involves creating and enforcing strong policies. These policies should be based on evidence tailored to the healthcare environment and types of patient care and consider exposure risks. It's important for these policies to be clear, concise, and regularly updated to stay current with changes in diseases and best practices for preventing infections.¹ Additionally, they should detail the types of gear needed for situations, the correct procedures for putting it on and taking it off, and how often equipment should be changed to ensure optimal protection. Education and training are essential for healthcare workers to use gear effectively. Offering training programs helps ensure that workers understand why protective gear is necessary, know which protocols to follow, and understand the consequences of not following them. Training methods like simulations, real-life scenarios, and ongoing education sessions help reinforce the importance of following guidelines on gear. Managers play a role in overseeing these efforts to make sure all healthcare staff are knowledgeable about using protective gear correctly.^{21,22} Another important factor in management within the realm of PPE is resource allocation. It is crucial to ensure that healthcare workers receive the PPE in a manner that encourages compliance. Managers need to cooperate with procurement and supply chain teams to create a system for acquiring, distributing, and replenishing PPE supplies. Furthermore, it is crucial for the leadership team to take steps in recognizing shortages, devising conservation strategies when required, and exploring alternate sources to ensure a resilient

supply chain. The management of PPE usage in settings also entails nurturing a safety-oriented culture within the healthcare institution. Leaders play a role in fostering an environment where adherence to PPE protocols is not just anticipated but deeply embedded in the ethos. Managers should advocate for a safety mentality, highlighting the significance of safeguarding both healthcare personnel and patients. This involves encouraging communication channels, actively seeking input from frontline staff, and promptly addressing any issues or obstacles related to PPE utilization. Assessment and feedback mechanisms are components of effective clinical oversight concerning PPE. Regular evaluations of compliance rates, feedback from workers, and consistent monitoring of infection levels contribute to a responsive managerial approach. Managers should establish surveillance systems for monitoring PPE utilization, identifying areas for enhancement, and implementing actions as necessary. Moreover, gathering input directly from healthcare professionals offers a nuanced insight into the difficulties they encounter in complying with PPE guidelines, enabling targeted interventions. The management of PPE usage must also consider the evolving nature of diseases and emerging risks. Keeping guidelines up-to-date is crucial, relying on scientific findings and expert advice. It's important for supervisors to stay informed about advancements, in handling diseases and work closely with infection control teams to maintain efficient PPE protocols. The ability to adapt is crucial for healthcare organizations to be prepared for outbreaks or pandemics, especially when managing protective equipment (PPE) becomes even more important. During a disease outbreak, effective management includes crisis response and planning for increased capacity. Managers need to work with parties to create plans that detail how to increase PPE availability, adjust staffing levels, and ensure healthcare facilities can handle a sudden influx of patients while complying with PPE guidelines. These plans should be regularly reviewed, updated, and tested through simulations to assess their effectiveness in real-life situations. Managing the use of PPE and ensuring compliance among healthcare workers is a task that requires a comprehensive approach. From establishing evidence-based policies to providing education and training programs, allocating resources effectively, and continuously evaluating practices, good management is crucial for protecting both healthcare professionals and patients. As healthcare organizations deal with the challenges of disease control, taking a flexible approach to using PPE is key to maintaining strong and efficient healthcare delivery systems. Managers play a role as leaders in coordinating these efforts and promoting a culture of safety in the healthcare setting.

CONCLUSION

In summary, it is crucial to manage the use of protective equipment (PPE) and adherence to guidelines in healthcare settings to protect the health of both healthcare staff and patients. The importance of evidence-based

policies, thorough training, proper resource allocation, and flexibility in facing challenges is highlighted. Managers play a role in promoting a safety culture and overseeing the implementation of these strategies. As healthcare institutions tackle disease management hurdles robust PPE management practices are vital for maintaining healthcare services continuity and quality. Ongoing assessment, feedback loops, and crisis preparedness aid in responding to changing situations. Taking an approach to PPE management is essential for safeguarding all involved. By prioritizing safety culture, providing education, and ensuring access to gear, healthcare organizations can mitigate risks, safeguard their staff member's well-being, and enhance patient outcomes. The experiences gained from handling PPE during operations or emergencies offer insights for strengthening the resilience of global healthcare systems.

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REFERENCES

1. McCarthy R, Gino B, d'Entremont P, Barari A, Renouf TS. The Importance of Personal Protective Equipment Design and Donning and Doffing Technique in Mitigating Infectious Disease Spread: A Technical Report. *Cureus*. 2020;12(12):e12084.
2. Aloweni F, Bouchoucha SL, Hutchinson A, Shin YA, Hui XT, Nur' Azzah BS, et al. Health care workers' experience of personal protective equipment use and associated adverse effects during the COVID-19 pandemic response in Singapore. *J Adv Nurs*. 2022;78(8):2383-96.
3. George J, Shafqat N, Verma R, Patidar AB. Factors Influencing Compliance With Personal Protective Equipment (PPE) Use Among Healthcare Workers. *Cureus*. 2023;15(2):e35269.
4. Ahmed J, Malik F, Memon ZA, Taha BA, Aiman A, Sundus N, et al. Compliance and Knowledge of Healthcare Workers Regarding Hand Hygiene and Use of Disinfectants: A Study Based in Karachi. *Cureus*. 2020;12(2):e7036.
5. Anwar MM, Elareed HR. Improvement of hand hygiene compliance among health care workers in intensive care units. *J Prev Med Hyg*. 2019;60(1):E31-5.
6. Straub J, Franz A, Holzhausen Y, Schumann M, Peters H. Personal protective equipment and medical students in times of COVID-19: experiences and perspectives from the final clerkship year. *BMC Medical Education*. 2023;23(1):806.
7. Larson J, Rich L, Deshmukh A, Judge EC, Liang JJ. Pharmacologic Management for Ventricular Arrhythmias: Overview of Anti-Arrhythmic Drugs. *J Clin Med*. 2022;11(11):3233.
8. Benishek LE, Radonovich LJ, Blackley BH, Weissman DN. Healthcare workers' infection risk perceptions of aerosol-generating procedures and

- affective response. *Antimicrob Steward Healthc Epidemiol*. 2023;3(1):e29.
9. Richaud MC, Eidman L, Vargas Rubilar J, Viviana L, Belén M, María CK, et al. Perceived Concerns and Psychological Distress of Healthcare Workers Facing Three Early Stages of COVID-19 Pandemic. *Front Psychol*. 2022;13:742810.
 10. Meng Q, Liu W, Li Z, Hu X. Influencing Factors, Mechanism and Prevention of Construction Workers' Unsafe Behaviors: A Systematic Literature Review. *Int J Environ Res Public Health*. 2021;18(5):2644.
 11. Sfantou DF, Laliotis A, Patelarou AE, Sifaki-Pistolla D, Matalliotakis M, Patelarou E. Importance of Leadership Style towards Quality of Care Measures in Healthcare Settings: A Systematic Review. *Healthcare (Basel)*. 2017;5(4):73.
 12. Ystaas LMK, Nikitara M, Ghobrial S, Latzourakis E, Polychronis G, Constantinou CS. The Impact of Transformational Leadership in the Nursing Work Environment and Patients' Outcomes: A Systematic Review. *Nurs Rep*. 2023;13(3):1271-90.
 13. Saleem F, Malik MI. Safety Management and Safety Performance Nexus: Role of Safety Consciousness, Safety Climate, and Responsible Leadership. *Int J Environ Res Public Health*. 2022;19(20):13686.
 14. Zhao L, Yang D, Liu S, Nkrumah ENK. The Effect of Safety Leadership on Safety Participation of Employee: A Meta-Analysis. *Front Psychol*. 2022;13:827694.
 15. Badran EF, Jarrah S, Masadeh R, Alhanoof H, Rana S, Samar S, et al. Assessment of Perceived Compliance and Barriers to Personal Protective Equipment Use Among Healthcare Workers During the COVID-19 Pandemic's Second Wave Surge: "Walk to Talk" Cross-Sectional Correlational Study. *Disaster Med Public Health Prep*. 2021;17:e45.
 16. Griesi JM, Bernardes JM, Alonso M, Gómez-Salgado J, Ruiz-Frutos C, Fagundo-Rivera J, et al. Risk perception of healthcare workers in the first wave of the COVID-19 pandemic in Brazil. *Heliyon*. 2024;10(3):e25297.
 17. Ezike OC, Odikpo LC, Onyia EN, Michel CE, Ifeoma N, Ada CN, et al. Risk Perception, risk Involvement/Exposure and compliance to preventive measures to COVID-19 among nurses in a tertiary hospital in Asaba, Nigeria. *Int J Afr Nurs Sci*. 2022;16:100385.
 18. Birhanu Z, Ambelu A, Fufa D, Mohammed M, Ahmed Z, Jemal A, et al. Risk perceptions and attitudinal responses to COVID-19 pandemic: an online survey in Ethiopia. *BMC Public Health*. 2021;21(1):981.
 19. Haward R, Kalyan M. The Impact of Personal Protective Equipment on Healthcare Workers on COVID-19 Duty in a Tertiary Care Hospital in South India. *Cureus*. 2023;15(7):e41910.
 20. Alreshidi NM, Alghamdi S, Shibily F, Alaa M, Nofaa A, Loujain S, et al. The Association between Using Personal Protective Equipment and Headache among Healthcare Workers in Saudi Arabia Hospitals during the COVID-19 Pandemic. *Nurs Rep*. 2021;11(3):568-83.
 21. Couto TB, Menezes P, Silva JKB, Priscilla CH, Euma FS, Selma TV, et al. Personal protective equipment simulation training is associated with lower COVID-19 infection among healthcare workers. *Einstein (Sao Paulo)*. 2023;21:eAO0300.
 22. Jen HJ, Chou KR, Chang CY. Fostering Nursing Staff Competence in Personal Protective Equipment Education during COVID-19: A Mobile-Video Online Learning Approach. *Int J Environ Res Public Health*. 2022;19(15):9238.

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