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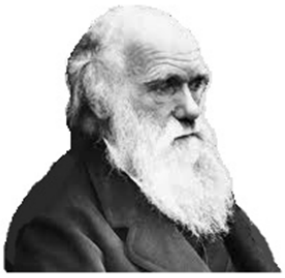

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Reflections on Healthcare Worker Safety and Mental Health: Lessons from the COVID-19 Pandemic for Primary Healthcare Centers

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ABSTRACT

The COVID-19 pandemic has presented unprecedented challenges to healthcare systems worldwide, particularly in safeguarding the health and well-being of healthcare workers (HCWs). This review highlights critical safety practices and mental health strategies essential for protecting HCWs in primary healthcare centers during public health emergencies. Key areas explored include injury prevention, effective environmental cleaning, waste management, ventilation systems, and timely post-exposure evaluations. The importance of effective communication and tailored task delegation to reduce occupational risks is also emphasized. Additionally, the review addresses the mental health toll of the pandemic on HCWs, identifying contributing factors such as workload pressures, lack of confidence in protective measures, and social isolation. The psychological impact, including anxiety, depression, and burnout, not only compromises the well-being of HCWs but also affects healthcare delivery. Strategies for mitigating these risks include providing access to confidential mental health services, fostering a culture of prevention, and implementing stigma-free support systems. By prioritizing safety and mental health, healthcare institutions can build resilient systems that protect HCWs while ensuring high-quality patient care. These measures are critical for enhancing healthcare systems' preparedness and response to current and future public health crises.

***Keywords*:** COVID-19, healthcare workers, mental health, safety, lessons

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1. INTRODUCTION

The COVID-19 pandemic represents one of the most significant global public health challenges of the 21st century, exerting unprecedented strain on healthcare systems worldwide. Healthcare workers (HCWs), as frontline responders, have borne a disproportionate burden, risking their health and well-being to provide essential care to patients. Their roles place them at high risk of exposure to SARS-CoV-2, the causative agent of COVID-19, due to frequent interactions with infected individuals and prolonged work hours in high-stress environments [1, 2]. Critical protective measures, including the proper use of personal protective equipment (PPE), adherence to rigorous hand hygiene protocols, and the implementation of environmental controls, have proven effective in reducing transmission risks [3, 4]. Nevertheless, even with these safeguards in place, HCWs have faced significant physical and psychological challenges during the pandemic.

The mental health toll on HCWs has been profound, with numerous studies documenting heightened rates of anxiety, depression, and burnout globally [5, 6]. Contributory factors include prolonged exposure to critically ill patients, insufficient access to PPE during the initial phases of the pandemic, long working hours, and feelings of helplessness amidst high mortality rates [7, 8]. Compounding these stressors, organizational changes such as workforce redeployments, resource shortages, and increased workloads have exacerbated fear, social isolation, and job-related stress among HCWs [9]. Such conditions highlight the urgent need for robust support systems to safeguard HCWs' physical and mental health.

Recognizing the indispensable role of HCWs in combating COVID-19 is imperative in prioritizing their safety and well-being. Effective interventions should integrate comprehensive safety practices with targeted mental health and psychosocial support strategies. This review examines key safety practices and mental health interventions for HCWs during the COVID-19 pandemic, emphasizing the importance of PPE, workplace training, and accessible mental health resources. By providing an evidence-based synthesis, this review seeks to inform policy and practice aimed at protecting HCWs, thereby enabling them to deliver high-quality patient care while maintaining their health and resilience.

2. THE HEALTHCARE FACILITY, HEALTHCARE WORKERS, AND PRIMARY HEALTHCARE

A healthcare facility refers to any institution or environment where healthcare services - such as diagnosis, treatment, and preventive care - are provided to patients. The personnel working within these facilities are collectively known as healthcare workers (HCWs) [10, 11]. HCWs are professionals dedicated to improving and promoting health through the execution of essential tasks aimed at health promotion, disease prevention, and patient care [11, 12]. These professionals include a broad range of skilled individuals, such as general practitioners, dentists, midwives, nurses, laboratory scientists, pharmacists, and healthcare assistants [11-14]. The healthcare facilities globally were estimated to have more than 59 million workers in 2019 before the COVID-19 pandemic [14].

Primary Health Care (PHC) forms the foundation of a country’s health system, serving as the first point of contact for individuals seeking healthcare [13]. PHC encompasses a wide spectrum of services, including promotive, preventive, curative, and rehabilitative care, and is

typically provided through health posts, clinics, health centers, and comprehensive health centers [15]. PHC is essential to delivering equitable healthcare and is supported by various stakeholders, including local governments, state or regional health ministries, non-governmental organizations, and international health organizations [15].

Globally, PHC services are delivered at the community level, often through small health units or clinics that provide essential healthcare services [13, 15]. These facilities are critical in meeting the health needs of populations, particularly in underserved or rural areas. The Minimum Health Care Package often outlines the key services that must be offered through PHC systems, focusing on areas such as maternal and child health, communicable disease control, nutrition, health education, and community development [16].

3. BIOLOGICAL HAZARDS AND INFECTION RISKS FOR HEALTHCARE WORKERS

Exposure to harmful biological agents poses a significant health risk to healthcare workers, especially when these agents are highly virulent, difficult to treat, or prone to rapid mutation [17]. HCWs, including paramedics and first responders, are at heightened risk of exposure to biological hazards. The level of exposure can vary depending on factors such as the prevalence of disease in the population, the nature of the healthcare environment, the type of service being provided, and the likelihood of transmission through contact with infected individuals [17, 18].

Healthcare workers are particularly vulnerable to infectious diseases, with common routes of exposure including airborne droplets (generated when speaking, coughing, or sneezing), blood, and direct contact with bodily fluids such as pleural, pericardial, synovial, cerebrospinal, peritoneal, amniotic fluids, vaginal secretions, semen, and saliva during medical procedures [18]. These exposures make HCWs susceptible to infections such as SARS-CoV-2, tuberculosis, HIV, measles, and varicella, as well as respiratory illnesses like influenza and latent tuberculosis. According to Amnesty International [19], approximately 7,000 healthcare workers globally lost their lives during the COVID-19 pandemic, highlighting the significant risks faced by HCWs worldwide, particularly in regions with high rates of disease and limited resources [18].

4. SARS-COV-2 AND HEALTHCARE WORKERS: RISKS AND CHALLENGES

The SARS-CoV-2 virus, responsible for the COVID-19 pandemic, has presented a significant challenge to global health systems, infecting millions of people worldwide. Healthcare workers (HCWs), as frontline responders, have been at a heightened risk of exposure to the virus. SARS-CoV-2 primarily spreads through person-to-person transmission, including via nasal droplets, aerosols, and fomites, which are particularly common in healthcare settings [20]. During the pandemic, the exposure of HCWs to COVID-19 increased significantly, leading to higher rates of infection among them compared to the general population [21].

The pandemic also exacerbated stress, burnout, and anxiety among HCWs, further impacting their overall health and well-being [22, 23]. In addition to the biological risks posed by the virus, HCWs have had to contend with the psychological and emotional toll of working

during an unprecedented global health crisis. The prolonged exposure to high-risk situations, combined with concerns about their health and the well-being of their families, has led to significant mental health challenges among HCWs.

Amnesty International reported that over 7,000 HCWs lost their lives due to COVID-19 globally [24]. The increased risk of developing respiratory infections, such as tuberculosis, among HCWs working with COVID-19 patients, underscored the critical need for protective measures. The effective use of personal protective equipment (PPE), well-designed healthcare facilities, proper ventilation, and timely access to updated information about health risks are essential to safeguarding HCWs during such global health crises.

4. 1. Workplace hazards for healthcare workers

Healthcare workers (HCWs) faced numerous health risks, many of which were influenced by workplace conditions. Factors such as the design of healthcare facilities, overcrowding, lack of isolation rooms, and environmental contamination significantly contributed to their vulnerability. Research indicates that work-related stress, inadequate personal protective measures, and poorly designed facilities are strongly associated with a heightened risk of exposure to both biological and non-biological hazards [25, 26]. These occupational risks not only threaten the health and well-being of HCWs but also undermine the quality of care they provide.

When HCWs' health is compromised due to workplace hazards, their ability to deliver effective healthcare services is inevitably affected. This relationship highlights the critical importance of ensuring safe and supportive working conditions. Measures aimed at reducing exposure to harmful hazards - both biological, such as pathogens, and non-biological, such as ergonomic stressors - are essential. Creating supportive work environments that prioritize the physical and mental well-being of HCWs is integral to maintaining the resilience and efficiency of healthcare systems, particularly during public health crises like the COVID-19 pandemic.

4. 2. Occupational Risks and Challenges for Healthcare Workers

Healthcare workers (HCWs) were at significant risk of exposure to SARS-CoV-2 due to their close and frequent interactions with infected individuals. The risk was heightened during activities such as performing aerosol-generating procedures or handling contaminated surfaces and equipment. The extent of exposure was also influenced by factors such as the level of community transmission and the specific roles and responsibilities of healthcare workers. To address these risks effectively, workplace risk assessments are crucial for identifying areas and tasks with potential exposure and implementing preventive measures tailored to each healthcare role [13, 27]. Healthcare facilities present a wide range of occupational hazards, including biological, chemical, ergonomic, and psychological risks [13]. The absence of adequate personal protective equipment (PPE), unsafe working conditions, and high levels of work-related stress significantly increased healthcare workers' vulnerability during the COVID-19 pandemic, further exposing gaps in workplace safety measures and amplifying the threats to the physical and mental well-being of healthcare workers [13, 25].

4. 3. Exposure Risks in Primary Health Centers (PHCs) During the Pandemic

In primary health centers (PHCs), healthcare workers (HCWs) face unique and compounded risks due to the high potential for exposure to infectious agents, especially in the

context of the COVID-19 pandemic. PHCs are often the first point of contact for individuals seeking medical care, making them critical settings in the early identification and management of infectious diseases. However, many PHCs lack sufficient isolation facilities or adequate space to minimize the exposure of healthcare workers and patients, which heightens the risk of cross-contamination. HCWs in these settings are at increased risk of exposure to COVID-19 and other infectious diseases because they often manage cases with high viral loads in the absence of well-designed isolation rooms [25, 27].

The prolonged use of personal protective equipment (PPE), although essential for infection control, has contributed to additional physical challenges for HCWs. Extended periods of wearing PPE have led to a range of physical discomforts, such as skin irritations, rashes, dehydration, and heat stress. These conditions can cause significant discomfort and detract from the HCWs' ability to work efficiently, ultimately affecting their well-being and work performance. In many cases, the PPE required for prolonged use is bulky, uncomfortable, and challenging to wear for extended hours, contributing to fatigue and reduced effectiveness in providing care [25].

In addition to biological hazards, healthcare workers in PHCs are frequently exposed to chemical hazards, including disinfectants and cleaning agents used to maintain sterile environments. These substances, when used in high quantities or over extended periods, can cause respiratory issues, skin irritation, and other long-term health complications. The constant exposure to such chemicals, often in poorly ventilated areas, adds to the overall health burden faced by HCWs in these settings.

Beyond the physical risks, healthcare workers in PHCs also face considerable psychological challenges. The emotional and mental toll of working during the pandemic has been profound. HCWs are often tasked with managing an overwhelming caseload in understaffed settings, leading to burnout and fatigue. Many also face stigma related to their work with infectious patients, with some HCWs being ostracized by their communities due to fears of transmission. Furthermore, HCWs are sometimes subjected to harassment, both within healthcare settings and by patients, which exacerbates the psychological burden of their roles.

The combination of emotional strain, fear of exposure to the virus, and feelings of helplessness in resource-limited settings has contributed to significant mental health challenges for HCWs [28].

These factors underscore the need for comprehensive measures that address both the physical and mental health challenges faced by healthcare workers in PHCs. Adequate PPE, regular breaks, proper ventilation, and the provision of mental health support are essential to ensure the safety, well-being, and sustained ability of healthcare workers to deliver high-quality care. Creating a work environment that addresses these challenges is critical not only for the health of HCWs but also for the overall efficiency and effectiveness of healthcare systems, particularly in times of public health crises like the COVID-19 pandemic.

4. 4. Challenges Facing HCWs in Low- and Middle-Income Countries During the Pandemic

The vulnerabilities of healthcare workers (HCWs) have been particularly pronounced in low- and middle-income countries (LMICs) during the COVID-19 pandemic. These regions face unique challenges, such as limited resources, inadequate healthcare infrastructure, and weaker health systems, which exacerbate the risks faced by HCWs. In many parts of Africa, for instance, healthcare workers have been disproportionately affected by COVID-19 due to

overcrowded healthcare settings, lack of adequate personal protective equipment (PPE), and insufficient infection control protocols. Countries like Nigeria, which reported over 800 cases of COVID-19 among healthcare workers by mid-2020, highlight the severity of this issue and the critical need for interventions to safeguard these frontline workers [29].

In LMICs, there is often an inadequate supply of essential protective measures such as high-quality PPE, including N95 respirators, face shields, gloves, and gowns. This shortage has placed healthcare workers at significant risk of exposure, not only to COVID-19 but also to other infectious diseases, such as tuberculosis, which continues to present a significant burden in many of these regions [13]. The World Health Organization (WHO) and other advocacy groups have stressed the urgent need for sufficient PPE, along with appropriate hazard allowances, to protect healthcare workers and mitigate the risks associated with inadequate workplace safety measures [28, 30].

Additionally, the strain on healthcare systems in LMICs has been compounded by workforce shortages, low staff-to-patient ratios, and the increased burden of care during the pandemic. This has resulted in HCWs being overworked, stressed, and exposed to prolonged working hours under hazardous conditions, further increasing their susceptibility to both physical and mental health challenges. Reports indicate that healthcare workers in LMICs are often faced with difficult decisions, such as triaging patients under resource-limited settings, which adds to the emotional and psychological toll of their work [29, 30].

The ability of healthcare workers in LMICs to perform their roles effectively is directly tied to the adequacy of these protective measures. The physical and mental well-being of HCWs in these regions is critical to the overall functionality of healthcare systems, particularly in times of public health emergencies [30].

This relationship underscores the need for comprehensive strategies that not only address the immediate risks posed by infectious diseases but also focus on strengthening the health infrastructure and providing adequate support systems for healthcare workers. As part of efforts to improve HCW safety, increased investment in healthcare resources, including training, equipment, and mental health support, is essential for building resilient healthcare systems in LMICs, particularly in the context of future pandemics [31].

5. SAFETY PRACTICES GUIDELINES AGAINST COVID-19 AMONG PRIMARY HEALTHCARE WORKERS

Healthcare workers face numerous risk factors that increase their vulnerability to occupational hazards. These include overcrowding in healthcare settings, insufficient isolation facilities, inadequate PPE, and direct exposure during high-risk medical procedures. To address these challenges, the World Health Organization (WHO) has called for the implementation of rigorous infection prevention and control strategies, the provision of mental health support, and regular evaluations of workplace conditions [27].

Without adequate occupational health measures, healthcare workers are more likely to experience illness, absenteeism, and reduced productivity, all of which have a ripple effect on the quality of care provided to patients [31].

Ndejjo et al. [25] noted that the prevalence of such hazards is significantly influenced by the type of healthcare facility. While tertiary and secondary healthcare centers generally experience higher risks due to their focus on high-risk procedures, critical care, and specialized

treatments like pulmonology and infectious diseases, PHCs are primarily designed to deliver essential health services [22]. As a result, HCWs in tertiary and secondary centers are more frequently exposed to respiratory infections and laboratory-associated bacterial and viral pathogens [32,33]. Nevertheless, safety practices in all healthcare settings are indispensable, and these measures aim to prevent potential dangers or accidents, protect HCWs from occupational hazards, and reduce work-related stress, thereby ensuring uninterrupted and effective healthcare delivery to patients.

COVID-19 has presented an unprecedented global challenge, placing immense pressure on healthcare systems and exposing HCWs to significant risks. As the first line of defense, HCWs are at heightened risk of contracting the virus, and to sustain the healthcare system and maintain continuous patient care, governmental and non-governmental organizations must prioritize protecting HCWs from COVID-19.

Personal protective equipment (PPE) plays a critical role in safeguarding HCWs, especially when used in combination with engineering and task-specific control measures. Since COVID-19 primarily spreads through respiratory droplets, precautionary measures such as social distancing and the use of surgical masks are crucial. Evidence shows that large viral particles in aerosols remain airborne for short distances of up to two meters, while smaller particles can travel farther and persist longer, increasing transmission risks [34, 35]. Maintaining a six-foot distance minimizes the risk of transmission through larger respiratory droplets, while surgical masks reduce the inhalation of smaller airborne particles [36].

5. 1. Training for Healthcare Workers

Employers have a fundamental responsibility to provide comprehensive training on workplace safety to minimize hazards for HCWs. This training should be offered at minimal or no cost, covering essential topics such as the epidemiology, transmission, and risks of infectious diseases. Effective training programs should be initiated before the commencement of duties, and conducted regularly, such as on a quarterly or yearly basis, the content must be presented in a clear, accessible format to ensure thorough understanding and be delivered by experts in occupational safety [37].

5. 2. Work Practice and Engineering Controls

Work practice controls involve modifying workplace activities to minimize exposure to hazards, while engineering controls focus on isolating, removing, or safely disposing of contaminated materials [38]. These controls are integral to reducing or eliminating exposure risks, and some examples include proper handwashing facilities, puncture-resistant tools, sealed containers for sharp objects, needle-protection devices, readily available PPE, and clear standard operating procedures for handling hazardous substances [38, 39].

5. 3. Personal Protective Equipment (PPE)

PPE forms a physical barrier between HCWs and health hazards, reducing the risk of exposure to harmful substances. Standard PPE includes surgical gowns, masks, and gloves, which should be worn during potential contact with contaminated materials or infected individuals. Although PPE does not eliminate hazards, it prevents direct contact, safeguarding the wearer. Hence, proper usage and adherence to guidelines are essential for effective protection [39].

5. 3. 1. Gloves

The use of gloves is an established standard in healthcare settings, providing essential protection when handling bodily fluids, secretions, or mucous membranes. Gloves must be changed between activities or procedures on the same patient and immediately discarded after use to prevent contamination of non-infected surfaces or individuals. Importantly, gloves do not substitute for hand hygiene, which must be performed after glove removal [38].

5. 3. 2. Facial Protection

To prevent exposure to infectious body fluids, droplets, and secretions, adequate facial protection is critical. HCWs must use surgical masks, face shields, or goggles to protect their eyes, nose, and mouth from potential contamination [38, 39].

5. 3. 3. Gowns

Protective gowns serve to shield the skin and clothing from contamination during medical procedures. HCWs should don gowns to prevent contact with bodily fluids and remove soiled garments immediately after use to minimize the risk of transmission [39].

5. 3. 4. Hand Hygiene

Hand hygiene is a cornerstone of infection control - HCWs should ensure hand hygiene before and after contact with each patient - before handling invasive devices, and after exposure to blood, bodily fluids, or contaminated items [38, 39]. The process involves thoroughly washing hands with soap and water for at least 20 seconds, followed by rinsing and drying with a clean towel. Alcohol-based hand sanitizers may also be used when soap and water are unavailable, ensuring all hand surfaces are covered and rubbed until dry [32, 39].

5. 3. 5. Vigilance Towards the Prevention of Injuries

Healthcare workers must exercise vigilance when handling sharp instruments and needles to prevent injuries that could facilitate the entry of infectious agents into the body [40]. Proper disposal of needles and sharp objects is essential to avoid harm to cleaning staff and other patients [41]. These safety practices collectively mitigate the risks posed by COVID-19, ensuring that HCWs remain protected while continuing to deliver high-quality care to their patients.

Health facilities should implement and enforce comprehensive cleaning strategies for all areas, including outpatient clinics, emergency rooms, wards, kitchens, and restrooms, to ensure a hygienic environment [37]. Special attention should be given to soiled linens, as they pose significant biological and chemical hazards, also a consistent supply of clean, sterilized linens should be maintained, and used ones should be properly managed to minimize pathogen transmission among hospital staff and patients [37, 40]. Additionally, clinical waste, such as blood, bodily fluids, secretions, human tissues, and laboratory waste, should be segregated, treated, and disposed of in compliance with environmental regulations, using appropriate color-coded systems to ensure safe handling [37].

Ventilation systems in healthcare facilities must be effective and tailored to the specific needs of the building. Decisions on natural, hybrid, or mechanical ventilation should account for climate, wind direction, floor plan, and the costs involved [42, 43].

Rooms designated for aerosol-generating procedures should have adequate air exchange capacity to minimize the risk of airborne pathogen transmission [31].

Effective communication plays a vital role in maintaining health worker safety. Prompt reporting of exposure to occupational or non-occupational hazards is necessary for timely investigation and management in line with WHO-recommended protocols [43]. Recommendations for infection management and return-to-work protocols should follow WHO guidelines (WHO, 2020a). Transparent and timely communication about SARS-CoV-2 transmission within health facilities and the broader community is a critical element of primary prevention.

Health workers who are elderly, pregnant, or have pre-existing medical conditions should not be assigned tasks with medium, high, or very high-risk levels, as recommended by the WHO [27]. New or inexperienced health workers, including students, volunteers, interns, and those returning to the workplace, may require additional supervision and support. Task delegation and role assignments should reflect their experience and skill levels, with provisions for regular supportive supervision [42, 43].

Surveillance measures should be implemented to identify critical incidents and mitigate their impact on the mental health of healthcare workers [44]. Strategies such as quality communication, accurate reporting, rotating workers between high-stress and low-stress functions, partnering inexperienced workers with experienced colleagues, and sending outreach personnel into communities in pairs are essential.

Post-exposure evaluations must be conducted immediately following hazardous exposures, and timely reporting of such incidents is critical to ensuring proper assessment and management. These evaluations are especially important in cases involving blood-borne pathogens, where swift action can prevent further complications.

6. MENTAL HEALTH AND PSYCHOSOCIAL SUPPORT FOR HEALTHCARE WORKERS EXPOSED TO COVID-19

The mental health and well-being of healthcare workers (HCWs) have been profoundly affected during the COVID-19 pandemic. Kisely *et al*. [44] highlighted multiple contributing factors, including direct contact with affected patients, impediments to performing job responsibilities, inadequate organizational support, redeployment to high-risk areas, a lack of confidence in protective measures, and the psychological toll associated with roles such as nursing.

Personal risk factors exacerbating mental stress among HCWs include limited education and clinical experience, insufficient training, part-time employment, prolonged quarantine, social isolation, childcare responsibilities, lower income, younger age, gender-related disparities, pre-existing physical health conditions, and lifestyle disruptions caused by the pandemic. Collectively, these factors increase the likelihood of anxiety, depression, and insomnia among healthcare workers [44].

The consequences of these mental health challenges are far-reaching. They can lead to reduced job performance, increased absenteeism, higher resignation rates, diminished workplace efficiency, and a heightened risk of human errors. Such outcomes not only compromise the well-being of HCWs but also endanger patient safety [27, 31].

Addressing these issues requires the availability of confidential mental health and psychosocial support services tailored to the needs of healthcare workers. These services should encompass both on-site and remote support options, allowing for early and discreet identification of mental health conditions such as anxiety and depression. Timely psychosocial support and first-line interventions are vital for addressing these challenges effectively.

Fostering a culture of mental health prevention within healthcare organizations can enhance the overall well-being of healthcare teams. Health workers who develop mental health conditions must feel supported in seeking help and returning to work without fear of stigma or discrimination. Such proactive measures not only safeguard the mental health of HCWs but also strengthen the resilience and efficiency of healthcare systems during crises [27].

7. CONCLUSIONS

The COVID-19 pandemic has underscored the critical importance of ensuring the safety, well-being, and mental health of healthcare workers (HCWs). As frontline responders, HCWs face significant occupational hazards, including exposure to infectious agents, mental stress, and the physical demands of their roles. This manuscript highlights the need for comprehensive measures to mitigate these risks, emphasizing the importance of proper waste management, environmental hygiene, effective communication, and timely post-exposure evaluations.

Equally critical is addressing the mental health and psychosocial needs of HCWs, as their psychological well-being is directly linked to their ability to deliver quality care. Confidential mental health services, stigma-free support systems, and organizational policies that prioritize worker safety and mental health are essential components of a resilient healthcare system.

By fostering a culture of safety, prevention, and support, health systems can safeguard the health of HCWs while ensuring the continuity and quality of care during public health emergencies and beyond. This holistic approach is vital for strengthening healthcare systems, enhancing worker satisfaction, and improving patient outcomes.

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