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Challenges in the Use of Personal Protective Equipment among Emergency Nurses in Burkina Faso

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Abstract
Introduction: Healthcare-associated infections (HAIs) are a significant risk in emergency departments. The use of personal protective equipment (PPE) is essential to mitigate these risks, but factors influencing PPE use need further exploration. This study aimed to assess factors affecting PPE use among emergency nurses at Yalgado Ouedraogo University Hospital (CHUYO), Burkina Faso.
Methods: A cross-sectional study, with a mixed method of quantitative and qualitative was conducted at Yalgado Ouedraogo University Hospital (CHUYO), Burkina Faso. Study participants were all of the nurses (25 nurses) and resource persons at Emergency Department. Data were collected through interviews using structured questionnaires for the quantitative data and in depth interviews and observations for qualitative data. Data analysis were done descriptively for quantitative data and content analysis and for qualitative data. Qualitative data then were categorized into themes.
Results: Most of the participants (95.65%) acknowledged the importance of PPE. The challenge of PPE use were the insufficient availability, poor quality, inadequate training, no room for donning and doffing, no functional laundry service for cleaning reusable PPE, and supply issues. More than 75% of nurses worked without PPE due to stockouts. Hand hygiene compliance was notably low at just 23.33%.
Conclusion: PPE's importance has been recognized by the emergency care nurses, however the challenges like insufficient and low quality stock and and infrastructure hinder its effective use. Improving management and training is crucial for enhancing PPE compliance and safety.

Keywords: Personal Protective Equipment; Healthcare-Associated Infections; Emergency Nurses; Hospital.

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Introduction

The use of Personal Protective Equipment (PPE) is essential for the safety of healthcare workers, especially the emergency nurses, who face an increased risk of infection and other biological hazards due to their roles. These healthcare professionals are in direct contact with patients who may be

carrying infectious diseases or involved in accidents. PPE, including gloves, masks, gowns, and eye protection, is crucial in preventing the transmission of infections between patients and healthcare workers.[1]

However, despite the critical importance of PPE, emergency nurses in low- and middle-income countries (LMICs), including Burkina Faso, face numerous challenges in using PPE effectively. These challenges arise from various factors, including insufficient supply chains, inadequate training on proper PPE usage, psychological and physical barriers related to prolonged PPE use. For instance, PPE can be uncomfortable, especially in hot and humid climates. Nurses may find difficulties when donning, doffing or disposing the equipment due to a lack of training or resources. These issues can lead to noncompliance with safety protocols, thereby increasing the risk of infection.[1]

In addition to logistical and technical barriers, the economic constraints faced by healthcare facilities in LMICs further complicate the access and effective use of PPE. Healthcare facilities in Burkina Faso, as in many other African countries, often experience PPE shortages due to the constraints in budget, delayed distribution, or the rise of price caused by inflation. This situation frequently leads to inadequate use of PPE, as the healthcare workers are forced to reuse the disposable items, which may increase the risk of contamination and compromising both worker and patient safety.[2]

The psychological burden of wearing PPE, especially during outbreaks of highly contagious diseases such as Ebola or COVID-19, also increase the challenge. Emergency nurses complained about the discomfort, isolation, and fear, as wearing PPE for a long period can resulted in anxiety and physical strain. These psychological challenges can affect nurses' performance, leading to fatigue, stress, and burnout, which may decrease the quality of care provided.[3]

Despite efforts by the government and international organizations to improve infection prevention practices and the availability of PPE, many healthcare workers in Burkina Faso still report insufficient training on proper PPE use. The lack of continuous education on infection prevention protocols and limited guidance on managing the practical and emotional challenges of PPE use, can result in ineffective safety measures in healthcare settings.[1]

This study aimed to explore the challenges faced by emergency nurses in Burkina Faso regarding PPE use, especially on barriers to its proper utilization and examining the factors that contribute to non-compliance. Understanding these challenges will help in developing targeted interventions and policies that can improve PPE use and enhance the healthcare workers' safety, particularly in emergency settings.[2]

Methods

Design

This study was conducted in a cross-sectional design, with a mixed-methods approach on July to August, 2018, at the medical emergency department of the Yalgado Ouedraogo University Hospital (CHUYO). The study aimed to assess the use of personal protective equipment (PPE) among nurses in the department. A comprehensive and reasoned sampling approach was applied to gather data, combining quantitative and qualitative research methods to explore perceptions, practices, and organizational factors related to PPE use.

Study targets.

The subjects were the nurses and key personnels working in the emergency department of CHUYO. Nurses were selected through a total sampling technique, ensuring that all nurses in the department were included in the study. Resource persons/key personnel were selected using purposive sampling, with selection based on their direct involvement in the management of PPE in the department. The sample consisted of 26 individuals in total, including both nurses and key resource persons.

Sample Size Limitation

It is important to note that while the sample size of 26 participants is sufficient for a descriptive study, it may limit the generalizability of the findings. A larger sample size would have offered a broader range of perspectives and provided a more thorough understanding of the challenges nurses face in using PPE. However, the study offers valuable insights into the specific context of CHUYO's emergency department.

Measure

The conceptual framework for this study was derived from the COOPER Theoretical Model of safety culture. This framework was divided into three key aspects:

- Psychological aspects: assessed through nurses' perceptions and beliefs regarding the use of PPE.
- Situational aspects: focused on the availability of PPE, protocols, and the organizational environment in which PPE is used.
- Behavioral aspects: examined nurses' actual practices concerning PPE use, including attitudes and behaviors related to its proper use.

Data collection techniques and tools

This study utilized a combination of quantitative and qualitative data collection techniques:

- Interview using structured questionnaire were used to gather quantitative data on the perceptions, beliefs, attitudes, and organizational aspects related to PPE use.
- In depth interview using a semi-structured interview guide for nurses was designed to collect qualitative data on the nurses' experiences, challenges, and insights regarding PPE use.
- In depth interview using a semi-structured interview guide for resource persons was focused on gathering information on the organizational aspects of PPE management, including policies, training, and resource availability.
- Observation using a check list was done to observe nurses' PPE practices and adherence to guidelines in real time.

The validity and reliability of these instruments were ensured through the expert review and pilot testing mentioned above. For qualitative data, interviews were recorded and transcribed for analysis. The study employed multiple data collection tools, which were carefully validated to ensure their reliability and relevance. Before the main data collection, a pilot test was conducted with a small group of emergency nurses at a different hospital to refine the questionnaires and interview guidelines. The pilot study helped identify ambiguities and gaps, improving the clarity and flow of the tools. Feedback from the pilot test was used to finalize the instruments. Additionally, the tools were validated

through expert review by professionals in the fields of infection control, nursing, and qualitative research to ensure their appropriateness to the study objectives.

Data analysis

Data analysis was performed using Microsoft Excel 2010 software. Quantitative data were analyzed by calculating proportions, where "0" or "1" corresponded to "No" or "Yes" responses, respectively. For multimodal variables, responses were grouped according to the modalities expressed. Total scores for each indicator were calculated to assess the level of PPE compliance, which was categorized as follows:

- Good: Compliance above 80%
- Medium: Compliance between 60% and 80%
- Low: Compliance below 60%

Qualitative data from interviews were transcribed verbatim. Units of significance were identified and grouped into themes. These themes were then analyzed to identify patterns and relationships, which were interpreted to provide insights into the factors influencing PPE use among nurses.

Ethical aspects.

The study was approved by the Health Research Ethics Board of Burkina Faso, under number 2018-7-092. All ethical guidelines were followed throughout the study, including obtaining informed consent from all participants. Confidentiality was maintained, and participants were assured that their responses would be kept anonymous. Ethical provisions, including the right to withdraw from the study at any time, were respected.

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Results

A total of 25 nurses and resource persons were interviewed for the study. Among these participants, the sex ratio (M/F) was 1.56, indicating a higher proportion of male participants compared to female participants. This suggests that within the context of the emergency department at Yalgado Ouedraogo University Hospital (CHUYO), the number of male nurses and resource persons were more than the female nurses, although the ratio is not highly skewed.

The average age of participants was 34.9 years, with a range from 28 to 46 years. This suggests that the study participants were relatively young, with the majority likely being in the early to middle stages of their careers. The age range indicates a diverse group in terms of experience, with the youngest participants likely to be newer to the profession and the oldest having more substantial experience.

The average professional seniority was 8.42 years, which indicates that, on average, the participants had moderate experience in the healthcare field. This level of experience suggests that the participants were sufficiently knowledgeable about clinical practices, including the use of PPE, though there may still be variability in terms of their exposure to and expertise in handling PPE, especially in different clinical scenarios.

Psychological factors related to PPE use

All staff members expressed concern about the risks of healthcare-associated infections (HAIs) in the department, with 100% acknowledging the high risk of infection. Similarly, all participants reported being concerned about these risks and stressed the importance of protecting themselves from potential infections. However, none of the respondents were aware of whether they had ever been affected by an HAI.

Regarding beliefs, 95.65% of respondents expressed confidence in

the ability of appropriate PPE to protect against HAIs and emphasized that wearing PPE was essential to protect their health and the health of patients.

However, all of the respondents indicated dissatisfaction with the quality of the PPE provided. They specifically noted that the gloves often tore during patient care, leading to frequent exposure to patients' body fluids. This reflects concerns about the adequacy and durability of the available PPE, which impact the safety and comfort

Situational factors

The situational factors assessed in the study focused on both "institutional" aspects and the "nurses' knowledge" of HAIs and PPE. Regarding the institutional factors, participants pointed out that continuing education on PPE and HAIs was rarely organized within the hospital. None of the respondents reported receiving training or supervision related to HAIs or PPE usage in the last three years. Additionally, all participants, including resource persons, mentioned the lack of guides/protocols and posters on HAIs and PPE in the emergency department. This gap in educational resources was also reflected in the observation that there were no posters on infection control measures, including the use of PPE.

Furthermore, the department lacked essential infrastructure, such as a room for PPE donning and doffing, a functional laundry service for cleaning reusable PPE, and functional hydroalcoholic gel dispensers due to supply issues. The only available handwashing station was manually operated. The garbage cans and bags were available, but they were not color-coding based on the standards.

PPE supply and management

PPE provision in the service was based on expressed needs and available stock, with allocations made accordingly. However, some PPE items, such as gowns, aprons, and glasses, were not consistently requested by the emergency department, leading to gaps in their availability. The procurement process, which depended on tendering procedures, often resulted in delays and interruptions in the supply chain, particularly during times of financial or logistical challenges. For instance, strikes and other supply chain disruptions affected the timely delivery of PPE.

Additionally, the department's stock of PPE was insufficient and incomplete. Gloves and bibs were the most commonly available items. However, even these were often in short supply. PPE were allocated individually by the care team, based on the type of care to be provided, to avoid waste.

The lack of hand hygiene supplies was also a significant issue. There were no continuous supplies of hydroalcoholic gel (GHA) for dispensers, and only soap was available for handwashing. This shortage of hand hygiene products was due to the limited budget for procurement.

One resource person managing PPE in the service mentioned that, while PPE allocations were based on the department's expressed needs, the available stock was still insufficient and incomplete. They specifically noted that gowns and clogs were not available in stock, while the laundry service for reusable PPE was not operational.

PPE availability and access

All participant nurses reported that PPE was not always available and, when available, was not always accessible. They also rated individual PPE allocations as infrequent. Special allocations of gowns and clogs were

considered rare by 100% of respondents. Due to this, many nurses resorted to personal acquisitions for PPE and did not have access to spare gowns in case of contamination. One major reason for this was the absence of a storage cabinet for PPE. Gloves were the most available PPE, followed by bibs, as reported by 100% and 43.47% of respondents, respectively.

Respondent's knowledge of HAIs and PPE

Assessing the nurses' knowledge of healthcare-associated infections revealed significant gaps. None of the respondents were able to correctly define HAIs or identify their time of occurrence and the appropriate care settings. Moreover, no participant was able to list all modes of transmission or prevention methods for HAIs.

Regarding the sources of HAIs, only 17.39% of nurses could cite all the possible sources of infection, with the most frequently mentioned sources being the environment and the patient. Interestingly, 52.17% of respondents also identified insufficient asepsis as a source of infection, highlighting a potential area for improvement in infection control practices.

About half of respondents defined PPE correctly as the means of protection against HAIs. However, none of the participants acknowledged the full scope of PPE's role, including its protection of the patient, caregiver, and the environment. Approximately one-third of respondents recognized the importance of PPE for protecting both patients and caregivers, but the majority did not have a comprehensive understanding of its broader protective functions (Figure 1).

The various components of PPE mentioned by the nurses from the emergency departments of CHU-YO are depicted in Figure 2. However, no respondent was able to name all the constituent elements of PPE. The most frequently cited PPE items were gloves, gowns, and clogs.

Behavioral factors related to PPE wearing

All respondents expressed their willingness to consistently wear PPE if it were available and accessible. However, in the event of contamination, there were no spare gown available due to limited number of gowns in the department and the lack of storage cabinets for proper gown preservation. More than three-quarters of respondents reported that they had ever worked without PPE because it was unavailable or inaccessible. Additionally, all 23 nurses reported walking around the yard and in various wards while wearing their PPE. Many indicated that they wore the same gown for more than a day and took their gowns and clogs home for cleaning. The primary reasons for these practices were the lack of spare gowns, the absence of wardrobes, and the lack of a functional laundry service in the department.

Nurses' Practices Regarding PPE Use

In terms of compliance with PPE guidelines, overall adherence was considered average, with a compliance rate of 75.5%. In contrast, precautionary measures such as hand hygiene were observed at a lower rate of 36.82%. Specifically, for hand hygiene, which is a critical precautionary measure, compliance was reported to be only 23.33% (as shown in Table I).

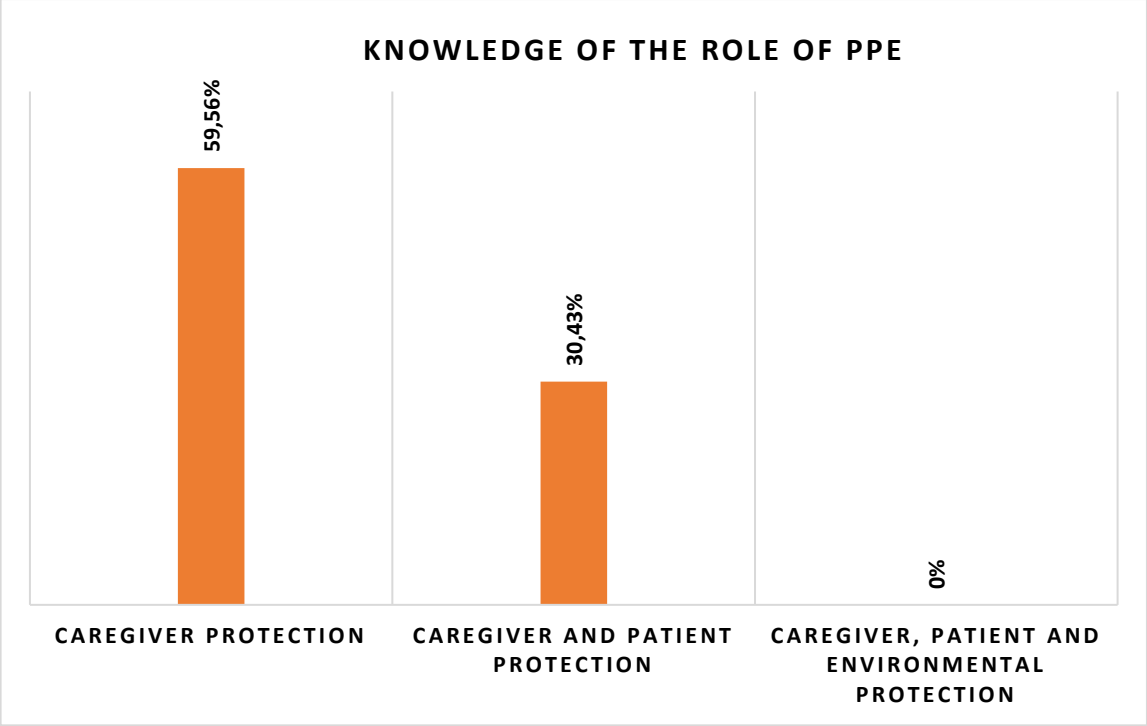

Figure 1. The knowledge on the role of PPE

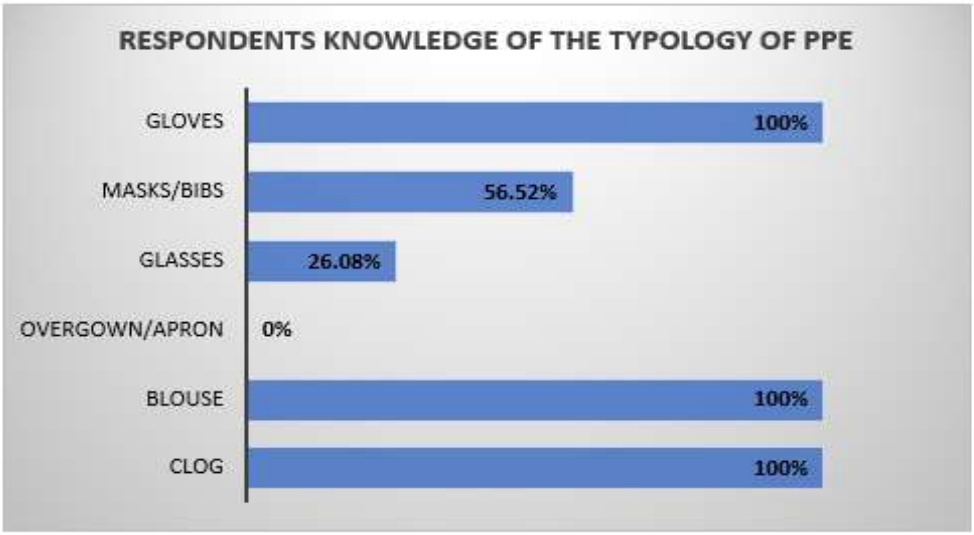

Figure 2. Respondent's knowledge of PPE composition

Table 1. Compliance of PPE Practices by Respondents

PPE type	Indicators	Number observation	Number of compliance	Score (%)	Average score (%)	Compliance level
Gloves	**Directions**				84.71	**Good**
	Drug Administration	32	30	93.75		
	Blood sampling	15	13	86.67		
	Venous catheter removal	22	22	100		
	Placement and removal of urinary catheters	8	8	100		
	Bandage	1	1	100		
	Patient engagement	3	2	66.67		
	Body manipulation	1	1	100		
	Precautions					
	Change between 2 patients	30	30	100		
	Change between 2 acts	*15*	*0*	*0*		
	Immediate withdrawal aftercare	30	26	86.67		
Bib mask	**Directions**				16.67	***Weak***
	Coughing/sneezing	2	1	50		
	Precautions					
	Put just before the gesture	2	0	0		
	Immediately remove and discard after the end of the gesture	2	0	0		
Blouse	**Directions**				64.29	***Medium***
	Administration of care	20	20	100		
	Precautions					
	Cleanliness of the blouse	20	16	80		
	Change if soiled	*16*	*0*	*0*		
Clogs	**Indication**				82.5	**Good**
	Presence in a care environment	20	20	100		
	Precautions					
	Cleanliness of hooves	20	13	65		
Hand washing	**Indication**					
	Before wearing PPE	*40*	*0*	*0*	*23.33*	***Weak***
	After wearing PPE	40	28	70		
	Precautions					
	Compliance with technology	***40***	***0***	***0***		
Overall average compliance score				***54.30***		***Weak***

Discussion

This study explores the factors influencing the use of personal protective equipment (PPE) among emergency nurses in Burkina Faso. The focus was on psychological, situational, and behavioral aspects.

Elements in Favor of Wearing PPE

The study found that all of the participants acknowledged the importance of PPE in protecting themselves from healthcare-associated infections (HAIs), with 95.65% believing that appropriate PPE was essential for infection prevention. This study aligns with findings from Michaels et al. (2011), who reported that healthcare workers knew about the protective role of PPE to minimize the exposure to bloodborne pathogens and other infectious agents in hospital.[4] Similarly,

Choudhury et al. (2020) found that healthcare workers in India had a strong support for the use of PPE as an important aspect of infection control in emergency care.[5]

The positive attitude toward PPE was also observed in several African studies. A study in Ghana found that healthcare workers also recognized the importance of PPE in protecting themselves to the risks of getting infections such as tuberculosis and hepatitis.[6] Similarly, Yeboah et al. (2019) reported that nurses in Ghana believed PPE was essential for their safety, particularly in high-risk environments like emergency and infectious disease departments.[7]

In the current study, all respondents showed a willingness to wear PPE if it were available and accessible. This supports the findings of Liu et al. (2019), which showed that healthcare workers' attitudes on PPE were generally positive when PPE was adequately provided.[8] Similarly, Sarkar et al. (2017) also found the important role of institutional support in ensuring PPE availability to improve adherence to safety protocols.[9]

Elements Against the Wearing of PPE

Despite the positive attitudes towards PPE, the study also identified several barriers to the use of PPE. The primary challenge was the lack of availability and accessibility of appropriate PPE. It is in line with findings from a study that showed the absence of spare gowns, storage facilities, and laundry services in the department. These issues contributed to improper use and long hours wear of PPE, such as wearing the same gown for more than one day. This observation aligns with Elston et al. (2017), who noted that inadequate infrastructure and poor PPE management often result in bringing PPE from home or wearing it for extended periods.[10]

Addo et al. (2018) reported that healthcare workers in Ghana frequently lacked essential PPE such as gowns and face shields, which led to increased vulnerability to infections in clinical settings.[11] This study also found that hand hygiene compliance was very low, with only 23.33% of participants adhering to recommended hand hygiene practices. This is consistent with findings from Seale et al. (2015), who reported that compliance with hand hygiene and other infection control practices remains a significant challenge in the condition where resource are limited due to insufficient facilities and inadequate training.[12] In this study, the lack of hand hygiene supplies, particularly hydroalcoholic gel, was a critical factor for infection prevention practices, which has also been shown by Pillay et al. (2021). The shortages of hand sanitizers and inadequate handwashing facilities were identified as significant barriers in healthcare settings.[13]

Psychological and Situational Factors

The psychological factors identified in this study, such as high concern for HAIs risk and a belief in the effectiveness of PPE, are consistent with the findings from other studies in sub-Saharan Africa. Kumar et al. (2019) reported that healthcare workers in low-income countries were highly motivated to use PPE due to the perceived risk of having infectious diseases, but the inavailability and lack of training prevent them to use PPE optimally.[14] Similarly, the other study by Adusei et al. (2017) in Ghana found that healthcare workers showed their concern about the high risks of HAIs but inadequate stock and poor training preventing them from using PPE consistently.[6]

The situational factors, such as the lack of training, protocols, and guidelines, were also significant barriers. These findings are in line with Ndlovu et al.

(2017), who found that healthcare workers in Zimbabwe faced similar challenges in adhering to PPE protocols. Insufficient training and a lack of institutional guidelines about PPE use hindered them from the compliance.[15] In addition, the lack of functional PPE dispensers and inadequate stock management found in this study were similar to the results from Tariq et al. (2020), where supply problems and poor management in infection control were identified as barriers at the hospital in Pakistan.[16] In Ghana, Osei et al. (2015) also found the lack of clear infection control protocols and the inadequate management of PPE as significant challenges in healthcare settings.[17]

Conclusion

This study showed factors influencing PPE use among emergency nurses in Burkina Faso, including psychological, situational, and behavioral elements. While nurses recognize the importance of PPE in preventing healthcare-associated infections (HAIs), issues such as inavailability, accessibility, and quality of PPE, as well as a lack of training and infrastructure, hinder the consistent use of PPE. To improve adherence to PPE guidelines, healthcare institutions must focus on better stock management, training, and establishing clear infection control protocols. Addressing these challenges is crucial to enhancing both healthcare worker safety and patient protection.

Ethics approval

This study received ethical approval from the Burkina Faso Health Research Ethics Committee, under number 2018-7-092. Ethical provisions were respected throughout the study.

Availability of data and materials

The data collected and analyzed during the study are available from the corresponding author and can be provided upon request.

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Author Contribution

All authors made a significant contribution to the conception, study design, execution, acquisition of data, analysis, and interpretation. Also, all authors took part in drafting, revising, or critically reviewing a manuscript. Finally, all the authors have agreed on the journal to which the manuscript has been submitted and gave final approval of the version to be published as well as agreed to be accountable for all aspects of the work.

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