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# Barriers of medication errors reporting in Chinese nurses: the main impact of face-saving and power distance



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# Barriers of medication errors reporting in Chinese nurses: the main impact of face-saving and power distance

**Abstract:** Objective: Medication error under-reporting is a global health safety problem and a great challenge to nursing quality management. The purpose of this study was to provide a reference for safe medication management in hospitals and explore the reporting barriers and related factors of medication errors among nurses in hospitals in China. Methods: 444 nurses from a tertiary hospital in Chengdu were investigated using a Self-made social demography questionnaire, the Barriers to MAE Reporting Questionnaire, the Working Environment Questionnaire, the Index of Hierarchy of Authority, and the Face-Saving Scale. Results: 432(97.30%) valid questionnaires were collected. Nurses' medication error reporting barriers mainly come from the Fear of reporting consequences. Face-saving, index of hierarchy of authority, and working environment were the main influencing factors of barriers to MAE reporting, which could explain 82.4% of the barriers' variance ($R^2 = 0.826$, $R^2adj = 0.824$, $F = 253.665$, $P < 0.001$), among them, working environment is the protective factor of reporting barriers. Still, face-saving and the index of hierarchy of authority are the main risk factors. Conclusion: Face-saving and power distance mainly affect Chinese nurses' barriers to medication errors. Improving the working environment may help reduce medication error reporting barriers. Still, more importantly, hospital managers need to take adequate measures to reduce nurses' sense of face-saving and power distance, which may be more helpful in reducing the barriers to medication error reporting and improving hospital medication safety management.

**Keywords:** medication errors, nurses, barriers, reporting, patient safety

## Introduction

Medication safety is essential to nurse quality and patient safety[1]. In 2017, the World Health Organization published the Third Global Patient Safety Challenge (innocuous medicines use) to reduce medicines-related harm over the next 5 years[2]. Medication administration error (MAE) is any preventable event that occurs during medication management or use by healthcare professionals, patients, or consumers at

any stage, which may directly or indirectly lead to inappropriate medication use or patient harm[3]. MAE, which may occur at any stage of medicines treatment, accounts for about 1/4 of medical error events and is an integral part of safety management[4]. Many MAEs may be minimal, with little clinical significance or no adverse effect on the patient; tragically, however, some may lead to patient potential or direct health damage, prolonged hospital stay, or even death. In addition, MAE can increase the medical expenses for patients or hospitals and undermine the public's confidence in the medical services they provide in hospitals[5,6]. Globally, the annual cost of MAE reaches as high as 420 billion US dollars, accounting for nearly 0.7% of the total medical expenses worldwide; it's a recognized announcement regarding public health and safety concerns[2].

Critiquing the person involved in errors or encouraging them to be more careful does not prevent errors from occurring, as it does not change the fundamental conditions that lead to errors[6]. Identifying and analyzing the cause of MAE may be helpful to modify the management loophole, take active preventive measures, and improve the safety of medicines use[7-11]. However, reliance on incredibly accurate and voluntary user reporting may be the key to analyzing MAE and be an essential strategy for medicines safety management[12,13].

In hospitals, MAE is the most common type of medication error. Rehan's study showed that 5 medication errors occur per 100 administrations[14]. According to Wang's investigation, the MAE rate is 49.32% and can be as high as 56.7% in the intensive care unit[15]. Nurses are crucial in reporting and preventing MAE. They are the last line of defence for safe medication use in the medication management chain, including identifying and avoiding own errors as well as errors made by physicians, pharmacists, and other healthcare providers[16]. Nursing staff voluntarily reporting, and actively summarizing experiences from error reporting may be the primary means to reduce the incidence of medication errors or improve the safety of medication use[7]. Therefore, it is extremely essential to encourage and pay attention to nurses' reporting of MAE. However, disappointingly, studies show that nurses face many barriers when reporting MAE. According to Vrbnjak's investigation, only 37% to 67%

of medication errors are reported by nurses[17].

Previous studies have shown that work environment, personnel relations, management measures, organizational level, and other factors were the impact factors of barriers to nurses' MAE reporting[18,19]. According to our knowledge, the research on the barriers to and influencing factors of nurse MAE reporting needs to be more comprehensive in China, primarily since unique factors such as regional culture must be addressed. According to Hofstede's survey data, organizations such as China, Singapore, and South Korea have higher power distance values and belong to countries with high power distances relative to most countries in the United States and Europe. For example, China's power distance value is 80, but the United States is 40[20]. Besides, it is worth noting that of particular interest is that Chinese organizations tend to have "Paternalistic" leadership; the managers are often seen as omnipotent elders[21]. Influenced by those organizational culture, reporting barriers and influencing factors may have cultural characteristics in the Chinese nurse[22,23]. Identifying the barriers to MAE reporting and the factors influencing reporting barriers, including cultural traits, may provide strategic assistance for the safe medicines administration of nurses in China. To this end, we focused on the impact of work environment, power distance, and face-saving on nurses' MAE reporting barriers in China.

**Working environment**

The Nurse's Work Environment (Work Environment WE) is an organizational feature that promotes or limits nursing practice, including factors such as healthcare resource allocation and cultural climate[24,25]. Previous studies have shown that the work environment significantly influences nurses' medication error reporting[22,26,27]. Workload and workforce allocation are reported to directly impact the reporting level of nurse medication errors[28,29]. A survey of Korean nurses by Vrbnjak et al. found that positive organizational culture can positively influence nurses' reporting intention of MAE[30]. Blegen et al. reported that nurses' work environment was negatively associated with reported medication errors[12]. Nurses may be less willing to take the time to fill out reports of medication errors with insufficient hardware, lack of space,

limited medical supplies, etc., as this situation may have led to a lot of extra time spent on non-nursing work. Similarly, Fang's study reported that the working environment can positively affect nurses' willingness to report adverse events[31]. In other words, the better the hospital working environment, the more likely nurses are to voluntarily report adverse medical events.

**Power distance**

The power distance, first proposed by the Dutch social psychologist Mauk Mulder, refers to the degree of concentration of power level or authoritarianism of leadership in an organization[32]. The sense of power distance refers to the individual's acceptance of the unequal distribution of power in the organization and the emotional distance between superior and subordinate[33]. Since the 20th century, power distance has been gradually applied to social psychology, business management, human resource management, and other studies. However, there are few studies in the nursing field. Under the influence of traditional culture, the status of authority and the respect for seniority are emphasized within the family and the organization. The relationship between elders and juniors, as well as between superiors and subordinates, is more vertical in China. Understandably, as organizations tend to be the paternalistic leadership, subordinates may have a higher sense of power distance and are more likely to rely on the superior attitude when making decisions[34,35]. Moreover, studies have reported that organizations with a greater sense of power distance emphasize power and use power to influence others[36], particularly in women-led organizations with a single gender subject[37,38]. In China, where the vast majority of nurses and nurse leaders are female, based on cultural traditions and nursing organizational characteristics, we have sufficient reason to believe that the decision to report an MAE may depend in part on nurse individuals[39], The sense of power distance may be an essential factor that affects nurses' MAE reporting disorder.

**Face-saving**

Goffman believes that face is the positive social image people strive to win in specific social interactions[40]. Spencer-Oatey points out that "face" involves individuals, intimate contacts, and social groups, and the three are unified in social

interactions[41]. The issue of face-saving is an essential factor in managing interpersonal conflicts. Brown and Levinson's "Politeness theory" holds that individuals will adopt various rational behaviours to satisfy their facial needs[42,43]. Reciprocity is considered an inherent feature of face-saving behaviour, mutually constraining every social network member and even exerting coercion[44]. Ekman, Hirschfeld, and Taiwanese scholar Xu share the consensus that "face" originates from China's "shame culture" and has an undeniable dominance or influence on the behaviour of Chinese people[45]. To achieve harmony and avoid group conflict, the Chinese will pay more attention to saving face in interpersonal communication[46]. MAE belongs to adverse events or errors. Reporting MAE may not only damage one's own colleagues or the organization's face but also pose a threat to team harmony. Nurses may be less likely to report MAE proactively to preserve their face, colleagues, or the group. Therefore, face-saving is expected, another critical factor hindering MAE reporting by Chinese nurses[23,47].

**Present studies**

Our study aims to understand the barriers reported by Chinese nurses and the impact of work environment, power distance, and face-saving on MAE reporting barriers. The research findings are crucial for enriching the current literature on nurse-reported barriers to MAE. Still, they also offer strategic assistance for hospital nurses who are safe for medication management. Based on existing research and theory, we propose three specific hypotheses. Hypothesis 1: The main factors influencing reporting barriers for Chinese nurses in MAE are work environment, power distance perception, and face-saving. Hypothesis 2: Power distance perception and face engineering were significantly and positively associated with reporting disability in medical errors among Chinese nurses. Hypothesis 3: Work environment significantly correlates negatively with reporting barriers for Chinese nurses in MAE.

## Materials and methods

### Participants

The study used a convenient sampling method to investigate the clinical nurses in a tertiary general hospital in Chengdu, China. From September to November 2022,

444 clinical nurses participated in our survey anonymously. The questionnaire is open to all nurses; filling out and submitting it is considered voluntary participation in this study. The standards included are: 1. Obtaining a professional qualification certificate from the People's Republic of China; 2. Having at least 1 year or more of clinical nursing experience; 3. Nurses directly involved in medication therapy or medication management; 4. Nurses voluntarily participated in this study. Nurses who failed to complete the investigation were excluded.

**Methods**

All the tests were conducted in Mandarin Chinese.

**Procedure**

This study was approved by the Ethics Committee of Chengdu Sixth Hospital, with registration number ChiCTR1900020715 (Chinese Clinical Trial Registry number). The hospital appointed and trained an investigation nurse responsible for distributing the survey questionnaire and explaining unclear or ambiguous items raised by the participants on site. Participants were surveyed according to uniform guidelines. The nurse voluntarily participated in this study and completed the anonymous online survey via mobile phone. The questionnaire is a self-report scale, which the participants independently complete.

**Demographic variables**

The self-designed demographic questionnaire was utilized in this study to collect the characteristics of participants, including gender (male, female), age, Marital status (Married, Single, Others), Positional rank (Nurse, Nurse practitioner, Nurse-in-charge and above), educational background (college degree, bachelor's degree, or graduate degree) and length of nursing service were collected.

**Barriers to MAE Reporting Questionnaire（BMAERQ）**

The BMAERQ was initially developed by Wakefield et al.[48], and the Chinese version was translated and validated by Chiang et al.[22]. The questionnaire measures the barriers to nurse reporting through "Why there are no reports of MAE", with a total of 16 items, including three sub-scales: Fear (six items), reporting process (six items), and administrative barriers (four items). The scoring uses a Likert 6-point

scale, with positive scoring (1 = strongly disagree, 6 = strongly agree), and higher scores indicate that nurses perceive more reporting barriers. In previous studies, It's indicating good reliability and validity; the retest reliability and content validity were 0.727 and 0.899, respectively, and *Cronbach's α* was 0.880[22]. In this study, the *Cronbach's α* of this questionnaire was 0.940.

**Face-Concern Scale (FC) and Index of Hierarchy of Authority questionnaire (C-IHA)**

FC and C-IHA questionnaires were developed by Chinese scholar Chiang[22]. FC consists of 4 items used to assess the degree to which nurses are concerned with and maintain the face-saving needs of their colleagues in reporting errors, such as "Reporting can make colleagues who make mistakes feel embarrassed". C-IHA consists of 6 items used to assess the power distance nurses feel in decision-making, such as "Any decision we make must be approved by the nurse manager/leader". Both questionnaires use a Likert 6-point rating scale, with positive scoring (1 = strongly disagree, 6 = strongly agree); higher scores indicate a higher degree of concern and maintenance of colleagues' faces or a higher perceived power distance. Both questionnaires use a Likert 6-point rating scale, with positive scoring (1 = strongly disagree, 6 = strongly agree), where higher scores indicate a higher degree of concern and maintenance of colleagues' faces or a higher perceived power distance. Two questionnaires have good reliability and validity, with *Cronbach's α* of 0.70 for the FC scale and 0.80 for the C-IHA questionnaire in previous studies[22]. In this study, *Cronbach's α* for the FC scale is 0.861, and *Cronbach's α* for the C-IHA questionnaire is 0.795.

**Work Environment Questionnaire (WEQ)**

WEQ was designed by Blegen et al.[12]. The Chinese version was translated and validated by Jiang et al.[43] and used to measure nurses' perception of the working environment in the hospital or department. The Chinese version of the questionnaire contains 19 items, divided into four dimensions: medical configuration, human resources, quality management, and colleague relationships. The questionnaire uses

the Likert 5-point scoring method, with positive scoring ("1" means strongly disagree, "5" means strongly agree); the higher the score, the more satisfied the nurse is with the working environment of the department or hospital. In previous studies, the *Cronbach's α* of the questionnaire was 0.61~0.78[22,43]. The *Cronbach's α* in this study was 0.837.

**Statistical analysis**

This study used Excel 2019 and SPSS 26.0 (IBM, Armonk, NY, USA) for data entry and analysis. The Harman single-factor test was used to test for common method bias. Metric data was represented by mean ± standard deviation, while count data was represented by frequency and percentage. The differences in characteristics between variables were compared using independent sample t-tests or chi-square tests, and pairwise comparisons between multiple data sets were compared using the LSD method. The correlation between measurement data and barriers to MAE Reporting was analyzed using Pearson correlation; the main influencing factors of Barriers to MAE Reporting were analyzed using multiple linear regression. The significance level was set at $\alpha = 0.05$ (two-tailed).

**Results**

432(97.30%) nurses answered in the electronic questionnaire. According to Harman's single-factor test results, there are 11-factor eigenvalues greater than 1. The explanatory rate of the first common factor is 30.080%, which is less than the critical value of 40%, indicating no apparent standard method bias in this study[49].

**Demographic characteristics**

Table 1 shows the demographic variables and their relationship to the BMAERQ scores. The majority of participants were females (n = 408,94.4%), with a mean age of 33.16(SD = 7.84), more than 60.0% were married (n = 297,68.8%), and most nurses with The intermediate professional rank (n =335,77.5%). The Barriers to MAE Reporting score has statistically significant differences among age groups, work experience, job titles, and marital status, but not among the genders and educational backgrounds.

**Table 1. Demographic characteristics of research objects (*n*=432)**

| Variable | Sample *n (%)* | BMAERQ scores *Mean (SD)* | *t/F* | *P* |
|---|---|---|---|---|
| **Gender** | | | -0.804 | 0.422 |
| Male | 24(5.6) | 45.5(21.13) | | |
| Female | 408(94.4) | 48.24(15.9) | | |
| **Age(years)** | | | -2.746 | **0.006** |
| ≤30 | 190(44) | 45.65(17.36) | | |
| ＞30 | 242(56) | 50(15.02) | | |
| **Length of nursing work （years）** | | | -4.304 | **＜0.001** |
| ≤10 | 225(52.1) | 44.95(16.82) | | |
| ＞10 | 207(47.9) | 51.5(14.83) | | |
| **Education** | | | -0.235 | 0.815 |
| Below bachelor degree | 183(42.4) | 47.87(16.2) | | |
| Bachelor degree or above | 249(57.6) | 48.25(16.26) | | |
| **Positional ranks** | | | 5.951 | **0.003** |
| Nurse | 40(9.3) | 40.15(15.92)[b] | | |
| Nurse (Junior) | 57(13.2) | 46.84(20.1)[a] | | |
| Supervisor Nurse (Intermediate) | 335(77.5) | 49.25(15.26)[a] | | |
| **Marital status** | | | 6.584 | **0.002** |
| Unmarried | 119(27.5) | 43.58(15.74)[b] | | |
| Married | 297(68.8) | 49.88(16.39)[a] | | |
| Divorced or widowed | 16(3.7) | 48.31(8.79)[ab] | | |

LSD was used for multiple comparisons, and the differences between groups were labeled with letters

**Barriers to MAE reporting**

The results showed that nurses' standardized scores of barriers to MAE reporting were 3.01(SD = 1.01), the Fear dimension items have the highest standardized score of 3.42（SD = 1.11）, the Administrative barriers were 2.95（SD = 1.17）， and the Reporting process was 2.63（SD = 1.07）. " Administrators' responses to MAE do not match the severity of the errors" 、" Disagreement over MAE" 、" Adverse consequences from reporting" have the higher standardized scores, respectively. As shown in Table 2.

Table 2 Barriers to MAE reporting scores（*n*=432）

| Variable | Group *Mean (SD)* | Standardized *Mean (SD)* | Item *Mean (SD)* |
|---|---|---|---|
| **Fear** | 20.53（6.68） | **3.42（1.11）** | |
| 11. Adverse consequences from reporting | | | **3.66(1.46)** |
| 1. Not recognize MAE occurred | | | 3.43(1.55) |
| 8. Being blamed for MAE results | | | 2.97(1.37) |
| 3. Physicians' reprimand | | | 2.96(1.39) |
| 7. Being recognized as incompetent | | | 2.86(1.39) |
| 10. Patient's negative attitude | | | 2.75(1.36) |
| **Administrative Barriers** | 11.79（4.68） | 2.95（1.17） | |
| 12. Administrators' responses to MAE do not match the severity of the errors | | | **4.03(1.42)** |
| 15. Much emphasis on MAE as nursing quality provided | | | 3.03(1.43) |
| 14. No positive feedback | | | 2.94(1.40) |
| 16. Focus on individual rather than system factors to MAE | | | 2.52(1.21) |
| **Reporting Process** | 15.78（6.41） | 2.63（1.07） | |

| | | |
|---|---|---|
| 2. Disagreement over MAE | | **3.86(1.52)** |
| 5. Too much time for filling reports | | 3.42(1.49) |
| 9. Unrealistic expectation for administrating mediciness correctly | | 3.14(1.44) |
| 6. Think MAE not important enough to be reported | | 2.81(1.37) |
| 13. Unclear MAE definition | | 2.69(1.35) |
| 4. Too much time for contacting physicians | | 2.05(1.31) |
| **Barriers to MAE reporting** | 48.09（16.22） | 3.01（1.01） |

**Correlation analysis**

The survey results show that WEQ is negatively correlated with Barriers to MAE Reporting (r= -0.201, P< 0.01); FC (r= 0.866, P< 0.01), C-IHA (r= 0.799, P< 0.01) are positively correlated with Barriers to MAE Reporting, as shown in Table 3.

Table 3 Barriers to MAE reporting correlation analysis ($n$ = 432)

| Variable | Mean | SD | WEQ *r(P)* | FC *r(P)* | C-IHA *r(P)* | BMAERQ *r(P)* |
|---|---|---|---|---|---|---|
| WEQ | 77.06 | 77.06 | 1 | | | |
| FC | 12.5 | 12.5 | -0.161** | 1 | | |
| C-IHA | 19.52 | 19.52 | -0.113* | 0.702** | 1 | |
| BMAERQ | 48.09 | 48.09 | -0.201** | 0.866** | 0.799** | 1 |

**Multivariate regression analysis**

This study used the "stepwise" method to perform regression analysis on the influencing factors of the Barriers to MAE Reporting ($\alpha$ inclusion $\leq 0.050$,$\alpha$ exclusion $\geq 0.100$). Variables significant in the t-test, chi-square test, or correlation analysis results ($P \leq 0.05$) were included. Specifically, age, length of nursing work, positional ranks, marital status, FC, C-IHA, and WEQ were analyzed as independent variables. The results showed that FC, C-IHA, and WEQ were the influencing factors of Barriers to MAE Reporting, which could explain 82.4% of the variation in reporting

barriers ($R^2$ = 0.826, $R^2adj$ = 0.824, $F$ = 253.665, $P$ < 0.001), as shown in Table 4.

Table 4 Multiple regression analysis of Barriers to MAE reporting ($n$ = 432)

| Variable | *B* | *β* | *t* | *P* | *VIF* |
|---|---|---|---|---|---|
| Constant | 11.851 | - | 3.818 | ＜0.001 | - |
| FC | 2.012 | 0.591 | 20.715 | ＜0.001 | 2.127 |
| C-IHA | 1.004 | 0.377 | 13.303 | ＜0.001 | 2.035 |
| WEQ | -0.111 | -0.063 | -3.088 | 0.002 | 1.973 |

Dependent: Barriers to MAE reporting; ”-”: blank entry

**Discussion**

This study explores the current status and influencing factors of reporting barriers for Chinese nurses regarding MAE. We found that Fear is the main obstacle that hinders nurses from reporting MAE, including Fear of being reprimanded or punished, being perceived as incompetent, and Fear of negative attitudes from managers, colleagues, and patients. It's consistent with Chiang et al.'s report[22,50]. Similarly,there are also research reports that reporting MAE for oneself or others may lead to anxiety, shame, guilt, and other psychological issues[51]. Therefore, managers must adjust their attitudes and responses toward nurses' medication errors and focus on creating a harmonious departmental atmosphere.On the one hand, managers can find the cause of medication errors from a systemic organizational perspective when reporting them. The approach of not blaming or blaming individuals may positively affect nurses' reporting of MAE[19]. On the other hand, establishing and implementing a voluntary reporting error incentive mechanism is also necessary. It may help enhance nurses' candid reporting of MAE[52]. In addition, establishing smooth and effective reporting channels and reducing administrative barriers to reporting may also increase nurses' proactive reporting of MAE[53].

Secondly, in this study, nurses' demographic characteristics had no significant impact on the reporting barriers of MAE. The work environment was negatively correlated with nurse-reported obstacles, serving as a protective factor for MAE reporting. This is consistent with our research hypothesis and the majority of previous

studies[22,27,29]; the better the working environment in the hospital, the fewer obstacles nurses voluntarily report after medical incidents. However, it is worth noting that the correlation between the work environment and reporting barriers in our study is relatively weak, consistent with Chiang[22], but much lower than the research results of Dalky et al. Their research reported that the work environment explained 65.1% of variations in nurses' MAE reporting[29]. The differences in research results may be related to the cultural characteristics of different countries, the sources of the nurses participating in this survey and the environmental conditions of the hospitals where the surveyed nurses are located. In this study, the survey subjects come from the same hospital, where the allocation of organizational resources, cultural atmosphere, and the representativeness and diversity of management may need to be increased. Future research could be conducted in different types of hospitals to determine the impact of the work environment on reporting barriers to medication errors among nurses.

Furthermore, as expected, power distance and face saving are negatively correlated with nurse reporting barriers, an essential factor affecting medication errors reported by Chinese nurses, consistent with Chiang and Yang's research reports[22,23]. In the traditional cultural atmosphere of China, due to face-saving concerns, nurses may be unwilling to expose their mistakes in front of colleagues or willing to save colleagues' faces, choosing not to report their own or others' MAE. China is also a country with high power distance, where nursing organizations are predominantly female and tend to adopt a paternalistic management style. Nurses may have a higher level of power distance perception towards organizations. They may rely more on department managers to make decisions regarding error reporting. Therefore, the considerations of face-saving and the perception of power distance could seriously hinder the reporting of MAE[54]. Reducing face and power distance and establishing a safe and valued fair organizational culture may help Chinese nurses report barriers to medication errors and may also be a key supporting factor for medication safety[55, 56]. For example, establishing a particular management group that optimizes the reporting management system for nurses' MAE and manages people or things through the system may be beneficial in reducing face-saving. It may also help reduce the control

of managers over subordinates and the power-distance barriers for nurses in reporting MAE[57]. Especially for nursing management organizations that are predominantly female, reducing power distance may have more significant implications[37].

**Limitations**

This study is cross-sectional; causal relationships between variables must be carefully determined. The study only includes nurses from a tertiary hospital in Chengdu. Due to the influence of cultural or regional factors, the generalization of the conclusions may be limited. Future research should be expanded to verify and extend our results among populations from different regions and ethnic groups. This study focuses on the impact of cultural characteristics and work environment on nurses' reporting barriers and other factors that may influence or moderate nurses' reporting barriers. Future research could consider including potential influencing factors for study.

**Summary**

In short, our study identified the main barriers reported by Chinese nurses in MAE and the critical influencing factors of these barriers. Face-saving and power distance were the main risk factors reported by Chinese nurses in MAE. At the same time, the work environment was a protective factor, but with a lesser impact. Improving the nurses' work environment may help reduce the barriers reported in MAE. Still, more importantly, hospital administrators need to take adequate measures to reduce nurses' face-saving and power distance, which may be more helpful in reducing the barriers reported in MAE and improving medication safety management in hospitals.

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# The barriers to medication error reporting by nurses and factors associated with it: a cross-sectional study in a tertiary hospital of south-west China

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## ABSTRACT

**Objectives** To explore the reporting barriers and related factors of medication errors among nurses in hospitals in China and provide a reference for safe medication management in hospitals.

**Design** Cross-sectional, online survey.

**Setting** Responses were collected online from September 2022 to November 2022 across a specific tertiary hospital in Chengdu, China.

**Participants** Clinical Registered Nurse.

**Primary outcome measure** Measure the Barriers to Medication Administration Error Reporting Questionnaire、Face-Saving Scale, the Index of Hierarchy of Authority, and the Working Environment Questionnaire. Independent sample t-test, correlation analysis, and multiple linear regression analysis was performed to identify factors associated with the Barriers to Medication administration error Reporting.

**Results** 432(97.30%) nurses responded. Nurses' standardized scores of barriers to

medication administration error reporting were 3.01(SD = 1.01); the fear dimension items have the highest standardized score of 3.42（SD = 1.11); Working environment is negatively correlated with barriers to medication administration error reporting (r= -0.201, P< 0.01); Face-saving (r= 0.866, P< 0.01), index of hierarchy of authority, (r= 0.799, P< 0.01) are positively correlated with barriers to medication administration error reporting. All three were the main influencing factors of barriers to MAE reporting, which could explain 82.4% of the barriers' variance (R2= 0.826, R2adj = 0.824, F = 253.665, P < 0.001).

**Conclusions** Nurses' medication error reporting barriers mainly come from the Fear of reporting consequences. The working environment is the protective factor of reporting barriers. Still, face-saving and the index of hierarchy of authority are the main risk factors. Improving the working environment may help reduce medication error reporting barriers. Still, more importantly, hospital managers need to take adequate measures to reduce nurses' sense of face-saving and power distance, which may be more helpful in reducing the barriers to medication error reporting and improving hospital medication safety management.

**Strengths and limitations of this study**

- This rare study approaches the issue from the perspective of cultural traits on the barriers to reporting medication errors. It is worth noting that research on the barriers to reporting medication errors is still insufficient in China, and cultural characteristics are a significant influence.
- The survey thoroughly explores the positive and negative influencing factors of medication error reporting barriers among nurses in China and feasible pathways to improve medication error management.
- This study is cross-sectional; causal relationships between variables must be carefully determined.
- The Survey responses only include nurses from a tertiary hospital in Chengdu. Due to the influence of cultural or regional factors, the generalization of the conclusions may be limited.

**Keywords:** medication errors, nurses, barriers, reporting, patient safety

## Introduction

Medication safety is essential to nurse quality and patient safety[1]. In 2017, the World Health Organization published the Third Global Patient Safety Challenge (innocuous drug use) to reduce drug-related harm over the next 5 years[2]. Medication administration error (MAE) is any preventable event that occurs during medication management or use by healthcare professionals, patients, or consumers at any stage[3]. MAE accounts for about 1/4 of medical error events and is an integral part of safety management[4]. Many MAEs may be minimal, with little clinical significance or no adverse effect on the patient; tragically, however, some may lead to patient potential or direct health damage, prolonged hospital stay, or even death. In addition, MAE can increase the medical expenses for patients or hospitals and undermine the public's confidence in the medical services they provide in hospitals[5,6]. Globally, the annual cost of MAE reaches as high as 420 billion US dollars, accounting for nearly 0.7% of the total medical expenses worldwide; it is recognized as a public health and safety concern[2].

Critiquing the person involved in errors or encouraging them to be more careful does not prevent errors from occurring, as it does not change the fundamental conditions that lead to errors[6]. Identifying and analyzing the cause of MAE may be helpful to modify the management loophole, take active preventive measures, and improve the safety of drug use[7-11]. However, reliance on accurate and voluntary user reporting may be the key to analyzing MAE and be an essential strategy for medication safety management[12,13].

In hospitals, MAE is the most common type of medication error. Rehan's study showed that 5 medication errors occur per 100 administrations[14]. According to Wang's investigation, the MAE rate is 49.32% and can be as high as 56.7% in the intensive care unit[15]. Nurses are crucial in reporting and preventing MAE. They are the last line of defense for safe medication use in the medication management chain, including identifying and avoiding errors as well as errors made by physicians, pharmacists, and other healthcare providers[16]. Nursing staff voluntarily reporting and actively summarizing experiences from error reporting may be the primary means

to reduce the incidence of medication errors or improve the safety of medication use[7]. Therefore, it is extremely essential to encourage and pay attention to nurses' reporting of MAE. However, disappointingly, studies show that nurses face many barriers when reporting MAE. According to Vrbnjak's investigation, only 37% to 67% of medication errors are reported by nurses[17].

Previous studies have shown that work environment, personnel relations, management measures, organizational level, and other factors were the impact factors of barriers to nurses' MAE reporting[18,19]. According to our knowledge, the research on the barriers to and influencing factors of nurse MAE reporting needs to be more comprehensive in China, primarily since unique factors such as regional culture must be addressed. According to Hofstede's survey data, organizations such as China, Singapore, and South Korea have higher power distance values and belong to countries with high power distances relative to most countries in the United States and Europe. For example, China's power distance value is 80, but the United States is 40[20]. Besides, it is worth noting that of particular interest is that Chinese organizations tend to have "Paternalistic" leadership; the managers are often seen as omnipotent elders[21]. Influenced by organizational culture, reporting barriers and influencing factors may have cultural characteristics in the Chinese nurse[22,23]. Identifying the barriers to MAE reporting and the factors influencing reporting barriers, including cultural traits, may provide strategic assistance for the safe drug administration of nurses in China. To this end, we focused on the impact of work environment, power distance, and face-saving on nurses' MAE reporting barriers in China.

Previous studies have shown that the better the hospital working environment, the more likely nurses are to report adverse medical events[22,24,25] voluntarily. Nurses may be less willing to take the time to fill out reports of medication errors with insufficient hardware, lack of space, limited medical supplies, etc., as this situation may have led to much extra time spent on non-nursing work[26,27]. In addition, a positive organizational culture can also positively influence nurses' intention to report MAE[28].

The power distance refers to the individual's acceptance of the unequal distribution of power in the organization and the emotional distance between the superior and the subordinate[29]. Under the influence of Chinese traditional culture, the relationship between superiors and subordinates is more vertical; subordinates may have a higher power distance, Particularly in women-led organizations with a single gender subject[30,31]. At the same time, individuals with high power distances may tend to rely on their superiors' attitude when making decisions[32,33]. Based on cultural traditions and nursing organizational characteristics, hospital policies may encourage nurses to report medication errors, but high power distance structures may be a hindrance.

Goffman believes that face is the positive social image people strive to win in specific social interactions[34]. In China, "face" originates from "shame culture" and has an undeniable dominance or influence on the behavior of Chinese people[35]. To achieve harmony and avoid group conflict, the Chinese will pay more attention to saving face in interpersonal communication[36]. MAE belongs to adverse events or errors. Reporting MAE may not only damage one's colleagues or the organization's face but also pose a threat to team harmony. Nurses may be less likely to report MAE proactively to preserve their or colleagues' or the group's face. Therefore, face-saving may be another critical factor hindering MAE reporting by Chinese nurses[23,37].

**Present study**

Our study aims to understand the barriers reported by Chinese nurses and the impact of work environment, power distance, and face-saving on MAE reporting barriers. The research findings are crucial for enriching the current literature on nurse-reported barriers to MAE. Still, they also offer strategic assistance for hospital nurses who are safe for medication management. Based on existing research and theory, we propose three specific hypotheses. Hypothesis 1: The main factors influencing reporting barriers for Chinese nurses in MAE are work environment, power distance perception, and face-saving. Hypothesis 2: Power distance perception and face engineering were significantly and positively associated with reporting disability in medical errors among Chinese nurses. Hypothesis 3: Work environment significantly

correlates negatively with reporting barriers for Chinese nurses in MAE.

## METHODS

### Study Design and Setting

This was a cross-sectional study. Data were collected from September 2022 to November 2022 across a tertiary hospital in Chengdu, China. The anonymous questionnaire used the software "questionnaire star," was opened to all nurses; filled out and submitted was considered voluntary participation.

### Measurement

Participation was voluntary, and participants were informed prior to starting the survey that all data collected was non-identifiable and would only be used for research purposes. Before the survey, trained professionals provided uniform and neutral explanations to answer questions or inquiries. The questionnaire stipulates that each individual can only respond once to ensure a 100% consent rate and prevent multiple responses. The study obtained approval from the Ethics Committee of the Sixth People's Hospital of Chengdu, China（No: 2021-L-009）. The questions explored the following four themes:

**1.** Demographic variables

The self-designed demographic questionnaire was utilized in this study to collect the characteristics of participants, including gender (male, female), age, Marital status (Married, Single, Others), Positional rank (Nurse, Nurse practitioner, Nurse-in-charge and above), educational background (college degree, bachelor's degree, or graduate degree) and length of nursing service were collected.

**2.** Barriers to MAE Reporting Questionnaire（BMAERQ）

The BMAERQ was initially developed by Wakefield et al.[38], and the Chinese version was translated and validated by Chiang et al.[22]. The questionnaire measures the barriers to nurse reporting through "Why there are no reports of MAE", with a total of 16 items, including three sub-scales: Fear (six items), reporting process (six items), and administrative barriers (four items). The scoring uses a Likert 6-point scale, with positive scoring (1 = strongly disagree, 6 = strongly agree), and higher

scores indicate that nurses perceive more reporting barriers. In previous studies, It's indicating good reliability and validity; the retest reliability and content validity were 0.727 and 0.899, respectively, and *Cronbach's α* was 0.880[22]. In this study, the *Cronbach's α* of this questionnaire was 0.940.

**3.** Face-Concern Scale (FC) and Index of Hierarchy of Authority questionnaire (C-IHA)

FC and C-IHA questionnaires were developed by Chinese scholar Chiang[22]. FC consists of 4 items used to assess the degree to which nurses are concerned with and maintain the face-saving needs of their colleagues in reporting errors, such as "Reporting can make colleagues who make mistakes feel embarrassed". C-IHA consists of 6 items used to assess the power distance nurses feel in decision-making, such as "Any decision we make must be approved by the nurse manager/leader". Both questionnaires use a Likert 6-point rating scale, with positive scoring (1 = strongly disagree, 6 = strongly agree); higher scores indicate a higher degree of concern and maintenance of colleagues' faces or a higher perceived power distance. Both questionnaires use a Likert 6-point rating scale, with positive scoring (1 = strongly disagree, 6 = strongly agree), where higher scores indicate a higher degree of concern and maintenance of colleagues' faces or a higher perceived power distance. Two questionnaires have good reliability and validity, with *Cronbach's α* of 0.70 for the FC scale and 0.80 for the C-IHA questionnaire in previous studies[22]. In this study, *Cronbach's α* for the FC scale is 0.861, and *Cronbach's α* for the C-IHA questionnaire is 0.795.

**4.** Work Environment Questionnaire (WEQ)

WEQ was designed by Blegen et al.[12]. The Chinese version was translated and validated by Jiang et al.[39] and used to measure nurses' perception of the working environment in the hospital or department. The Chinese version of the questionnaire contains 19 items, divided into four dimensions: medical configuration, human resources, quality management, and colleague relationships. The questionnaire uses the Likert 5-point scoring method, with positive scoring ("1" means strongly disagree, "5" means strongly agree); the higher the score, the more satisfied the nurse is with

the working environment of the department or hospital. In previous studies, the *Cronbach's α* of the questionnaire was 0.61~0.78[22,39]. The *Cronbach's α* in this study was 0.837.

**Participants**

The hospital where the participants are located is a tertiary class A comprehensive academic institution hospital in southwestern China. The hospital's staff consists of 1,578 health and administrative personnel, among which there are more than 600 nursing professionals. 444 nurses who met the research criteria were invited to participate in this study. The standards included: 1. Obtaining a professional qualification certificate from the People's Republic of China; 2. Having at least 1 year or more of clinical nursing experience; 3. Nurses directly involved in medication therapy or medication management; 4. Nurses voluntarily participated in this study. Nurses who failed to complete the investigation were excluded.

**Patient and public involvement**

As this study focussed on clinical nurses, patients or the general public were not involved in the study design.

**Statistical analysis**

This study used Excel 2019 and SPSS 26.0 (IBM, Armonk, NY, USA) for data entry and analysis. The Harman single-factor test was used to test for common method bias. Metric data was represented by mean ± standard deviation, while count data was represented by frequency and percentage. The differences in characteristics between variables were compared using independent sample t-tests or chi-square tests, and pairwise comparisons between multiple data sets were compared using the LSD method. The correlation between measurement data and barriers to MAE Reporting was analyzed using Pearson correlation; the main influencing factors of Barriers to MAE Reporting were analyzed using multiple linear regression, the "stepwise" method to perform regression analysis on the influencing factors of the Barriers to MAE Reporting ($\alpha$ inclusion $\leq 0.050$,$\alpha$ exclusion $\geq 0.100$), variables are significant in the t-test, chi-square test, or correlation analysis results significance were included. The significance level was set at $\alpha = 0.05$ (two-tailed).

## Results

432(97.30%) nurses answered in the electronic questionnaire. According to Harman's single-factor test results, there are 11-factor eigenvalues greater than 1. The explanatory rate of the first common factor is 30.080%, which is less than the critical value of 40%, indicating no apparent standard method bias in this study[40].

## Demographic characteristics

Table 1 shows the demographic variables and their relationship to the BMAERQ scores. The majority of participants were females (n = 408,94.4%), with a mean age of 33.16(SD = 7.84), more than 60.0% were married (n = 297,68.8%), and most nurses with The intermediate professional rank (n =335,77.5%). The Barriers to MAE Reporting score has statistically significant differences among age groups, work experience, job titles, and marital status, but not among the genders and educational backgrounds.

**Table 1. Demographic characteristics of research objects (*n*=432)**

| Variable | Sample *n (%)* | BMAERQ scores *Mean (SD)* | *t/F* | *P* |
|---|---|---|---|---|
| **Gender** | | | -0.804 | 0.422 |
| Male | 24(5.6) | 45.5(21.13) | | |
| Female | 408(94.4) | 48.24(15.9) | | |
| **Age(years)** | | | -2.746 | **0.006** |
| ≤30 | 190(44) | 45.65(17.36) | | |
| ＞30 | 242(56) | 50(15.02) | | |
| **Length of nursing work （years）** | | | -4.304 | **＜0.001** |
| ≤10 | 225(52.1) | 44.95(16.82) | | |
| ＞10 | 207(47.9) | 51.5(14.83) | | |
| **Education** | | | -0.235 | 0.815 |
| Below bachelor degree | 183(42.4) | 47.87(16.2) | | |

| | | | | |
|---|---|---|---|---|
| Bachelor degree or above | 249(57.6) | 48.25(16.26) | | |
| **Positional ranks** | | | 5.951 | **0.003** |
| Nurse | 40(9.3) | 40.15(15.92)[b] | | |
| Nurse (Junior) | 57(13.2) | 46.84(20.1)[a] | | |
| Supervisor Nurse (Intermediate) | 335(77.5) | 49.25(15.26)[a] | | |
| **Marital status** | | | 6.584 | **0.002** |
| Unmarried | 119(27.5) | 43.58(15.74)[b] | | |
| Married | 297(68.8) | 49.88(16.39)[a] | | |
| Divorced or widowed | 16(3.7) | 48.31(8.79)[ab] | | |

LSD was used for multiple comparisons, and the differences between groups were labeled with letters

**Barriers to MAE reporting**

The results showed that nurses' standardized scores of barriers to MAE reporting were 3.01(SD = 1.01), the Fear dimension items have the highest standardized score of 3.42（SD = 1.11）, the Administrative barriers were 2.95（SD = 1.17）， and the Reporting process was 2.63（SD = 1.07）." Administrators' responses to MAE do not match the severity of the errors" 、" Disagreement over MAE" 、" Adverse consequences from reporting" have the higher standardized scores, respectively. As shown in Table 2.

Table 2 Barriers to MAE reporting scores（*n*=432）

| Variable | Group *Mean (SD)* | Standardized *Mean (SD)* | Item *Mean (SD)* |
|---|---|---|---|
| **Fear** | 20.53（6.68） | **3.42（1.11）** | |
| 11. Adverse consequences from reporting | | | **3.66(1.46)** |
| 1. Not recognize MAE occurred | | | 3.43(1.55) |
| 8. Being blamed for MAE results | | | 2.97(1.37) |

| | | | |
|---|---|---|---|
| 3. Physicians' reprimand | | | 2.96(1.39) |
| 7. Being recognized as incompetent | | | 2.86(1.39) |
| 10. Patient's negative attitude | | | 2.75(1.36) |
| **Administrative Barriers** | 11.79（4.68） | 2.95（1.17） | |
| 12. Administrators' responses to MAE do not match the severity of the errors | | | **4.03(1.42)** |
| 15. Much emphasis on MAE as nursing quality provided | | | 3.03(1.43) |
| 14. No positive feedback | | | 2.94(1.40) |
| 16. Focus on individual rather than system factors to MAE | | | 2.52(1.21) |
| **Reporting Process** | 15.78（6.41） | 2.63（1.07） | |
| 2. Disagreement over MAE | | | **3.86(1.52)** |
| 5. Too much time for filling reports | | | 3.42(1.49) |
| 9. Unrealistic expectation for administrating drugs correctly | | | 3.14(1.44) |
| 6. Think MAE not important enough to be reported | | | 2.81(1.37) |
| 13. Unclear MAE definition | | | 2.69(1.35) |
| 4. Too much time for contacting physicians | | | 2.05(1.31) |
| **Barriers to MAE reporting** | 48.09（16.22） | 3.01（1.01） | |

## Correlation analysis

The survey results showed that WEQ is negatively correlated with Barriers to MAE Reporting (r= -0.201, P< 0.01); FC (r= 0.866, P< 0.01), C-IHA (r= 0.799, P< 0.01) are positively correlated with Barriers to MAE Reporting, as shown in Table 3.

Table 3 Barriers to MAE reporting correlation analysis ($n$ = 432)

| Variable | Mean | SD | WEQ *r(P)* | FC *r(P)* | C-IHA *r(P)* | BMAERQ *r(P)* |
|---|---|---|---|---|---|---|
| WEQ | 77.06 | 77.06 | 1 | | | |
| FC | 12.5 | 12.5 | -0.161** | 1 | | |
| C-IHA | 19.52 | 19.52 | -0.113* | 0.702** | 1 | |
| BMAERQ | 48.09 | 48.09 | -0.201** | 0.866** | 0.799** | 1 |

**Multivariate regression analysis**

The multivariate regression analysis results showed that age, length of nursing work, positional ranks, marital status, FC, C-IHA, and WEQ were analyzed as independent variables. The results showed that FC, C-IHA, and WEQ were the influencing factors of Barriers to MAE Reporting, which could explain 82.4% of the variation in reporting barriers ($R^2 = 0.826$, $R^2adj = 0.824$, $F = 253.665$, $P < 0.001$), as shown in Table 4.

Table 4 Multiple regression analysis of Barriers to MAE reporting ($n = 432$)

| Variable | *B* | *β* | *t* | *P* | *VIF* |
|---|---|---|---|---|---|
| Constant | 11.851 | - | 3.818 | ＜0.001 | - |
| FC | 2.012 | 0.591 | 20.715 | ＜0.001 | 2.127 |
| C-IHA | 1.004 | 0.377 | 13.303 | ＜0.001 | 2.035 |
| WEQ | -0.111 | -0.063 | -3.088 | 0.002 | 1.973 |

Dependent: Barriers to MAE reporting; ”-”: blank entry

## Discussion

This study explores the current status and influencing factors of reporting barriers for Chinese nurses regarding MAE. We found that Fear is the main obstacle that hinders nurses from reporting MAE, including Fear of being reprimanded or punished, being perceived as incompetent, and Fear of negative attitudes from managers, colleagues, and patients. It's consistent with Chiang et al.'s report[22,41]. Similarly,there are also research reports that reporting MAE for oneself or others may lead to anxiety, shame, guilt, and other psychological issues[42]. Therefore, managers must adjust their attitudes and responses toward nurses' medication errors and focus on creating a harmonious departmental atmosphere.On the one hand, managers can

find the cause of medication errors from a systemic organizational perspective when reporting them. The approach of not blaming or blaming individuals may positively affect nurses' reporting of MAE[19]. On the other hand, establishing and implementing a voluntary reporting error incentive mechanism is also necessary. It may help enhance nurses' candid reporting of MAE[43]. In addition, establishing smooth and effective reporting channels and reducing administrative barriers to reporting may also increase nurses' proactive reporting of MAE[44].

Secondly, in this study, nurses' demographic characteristics had no significant impact on the reporting barriers of MAE. The work environment was negatively correlated with nurse-reported obstacles, serving as a protective factor for MAE reporting. This is consistent with our research hypothesis and the majority of previous studies[22,25,27]; the better the working environment in the hospital, the fewer obstacles nurses voluntarily report after medical incidents. However, it is worth noting that the correlation between the work environment and reporting barriers in our study is relatively weak, consistent with Chiang[22], but much lower than the research results of Dalky et al. Their research reported that the work environment explained 65.1% of variations in nurses' MAE reporting[27]. The differences in research results may be related to the cultural characteristics of different countries, the sources of the nurses participating in this survey and the environmental conditions of the hospitals where the surveyed nurses are located. In this study, the survey subjects come from the same hospital, where the allocation of organizational resources, cultural atmosphere, and the representativeness and diversity of management may need to be increased. Future research could be conducted in different types of hospitals to determine the impact of the work environment on reporting barriers to medication errors among nurses.

Furthermore, as expected, power distance and face saving are negatively correlated with nurse reporting barriers, an essential factor affecting medication errors reported by Chinese nurses, consistent with Chiang and Yang's research reports[22,23]. In the traditional cultural atmosphere of China, due to face-saving concerns, nurses may be unwilling to expose their mistakes in front of colleagues or willing to save colleagues' faces, choosing not to report their own or others' MAE. China is also a

country with high power distance, where nursing organizations are predominantly female and tend to adopt a paternalistic management style. Nurses may have a higher level of power distance perception towards organizations. They may rely more on department managers to make decisions regarding error reporting. Therefore, the considerations of face-saving and the perception of power distance could seriously hinder the reporting of MAE[45]. Reducing face and power distance and establishing a safe and valued fair organizational culture may help Chinese nurses report barriers to medication errors and may also be a key supporting factor for medication safety[46-48]. For example, establishing a particular management group that optimizes the reporting management system for nurses' MAE and manages people or things through the system may be beneficial in reducing face-saving. It may also help reduce the control of managers over subordinates and the power-distance barriers for nurses in reporting MAE[49]. Especially for nursing management organizations that are predominantly female, reducing power distance may have more significant implications[30].

**Limitations**

This study is cross-sectional; causal relationships between variables must be carefully determined. The study only includes nurses from a tertiary hospital in Chengdu. Due to the influence of cultural or regional factors, the generalization of the conclusions may be limited. Future research should be expanded to verify and extend our results among populations from different regions and ethnic groups. This study focuses on the impact of cultural characteristics and work environment on nurses' reporting barriers and other factors that may influence or moderate nurses' reporting barriers. Future research could consider including potential influencing factors for study.

**Conclusion**

In short, our study identified the main barriers reported by Chinese nurses in MAE and the critical influencing factors of these barriers. Face-saving and power distance were the main risk factors reported by Chinese nurses in MAE. At the same time, the work environment was a protective factor, but with a lesser impact. Improving the nurses' work environment may help reduce the barriers reported in

MAE. Still, more importantly, hospital administrators need to take adequate measures to reduce nurses' face-saving and power distance, which may be more helpful in reducing the barriers reported in MAE and improving medication safety management in hospitals.

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**Authors' contributions**

Yang L, Peng X, Song W, and Wu D were involved in all aspects of the study, including design, analysis, interpretation of data and preparation of the manuscript. Su H was involved with the design of the study and interpretation of data. Yang S and Wang C were involved with the interpretation of data and preparation of the manuscript. All authors contributed to intellectual content during the drafting and revision of the work and approved the final version of the manuscript. Wu D is the guarantor.

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The study obtained approval from the Ethics Committee of the Sixth People's Hospital of Chengdu, China (approval number 2021-L-009). Respondents were informed before starting the survey that study participation was voluntary, and completion of the questionnaire was considered informed consent.

**Availability of data and materials**

The data used and analyzed during the current study are available from the corresponding author on reasonable request. The data are not publicly available due to privacy or ethical restrictions.

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# The barriers to medication error reporting by nurses and factors associated with it: a cross-sectional study in a tertiary hospital of south-west China



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# The barriers to medication error reporting by nurses and factors associated with it: a cross-sectional study in a tertiary hospital of south-west China

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## ABSTRACT

**Objectives** To explore the reporting barriers and related factors of medication errors among nurses in hospitals in China and provide a reference for safe medication management in hospitals.

**Design** Cross-sectional, online survey.

**Setting** Responses were collected online from September 2022 to November 2022 across a specific tertiary hospital in Chengdu, China.

**Participants** Clinical Registered Nurse.

**Primary outcome measure** Measure the Barriers to Medication Administration Error Reporting Questionnaire、Face-Saving Scale, the Index of Hierarchy of Authority, and the Working Environment Questionnaire. Independent sample t-test, correlation analysis, and multiple linear regression analysis was performed to identify factors associated with the Barriers to Medication administration error Reporting.

**Results** 432(97.30%) nurses responded. Nurses' standardized scores of barriers to

medication administration error reporting were 3.01(SD = 1.01); the fear dimension items have the highest standardized score of 3.42（SD = 1.11); Working environment is negatively correlated with barriers to medication administration error reporting (r= -0.201, P< 0.01); Face-saving (r= 0.866, P< 0.01), index of hierarchy of authority, (r= 0.799, P< 0.01) are positively correlated with barriers to medication administration error reporting. All three were the main influencing factors of barriers to MAE reporting, which could explain 82.4% of the barriers' variance (R2= 0.826, R2adj = 0.824, F = 253.665, P < 0.001).

**Conclusions** Nurses' medication error reporting barriers mainly come from the Fear of reporting consequences. The working environment is the protective factor of reporting barriers. Still, face-saving and the index of hierarchy of authority are the main risk factors. Improving the working environment may help reduce medication error reporting barriers. Still, more importantly, hospital managers need to take adequate measures to reduce nurses' sense of face-saving and power distance, which may be more helpful in reducing the barriers to medication error reporting and improving hospital medication safety management.

**Strengths and limitations of this study**

Clinical nurses are the representative sample, and the results have potential clinical intervention significance.

Followed rigorous methodological and reporting guidelines.

This study is cross-sectional; causal relationships between variables must be carefully determined.

Responses only include nurses from a tertiary hospital in Chengdu. Due to the influence of cultural or regional factors, the generalization of the conclusions may be limited.

**Keywords:** medication errors, nurses, barriers, reporting, patient safety

## Introduction

Medication safety is essential to nurse quality and patient safety[1]. In 2017, the World Health Organization published the Third Global Patient Safety Challenge (innocuous drug use) to reduce drug-related harm over the next 5 years[2]. Medication

administration error (MAE) is any preventable event that occurs during medication management or use by healthcare professionals, patients, or consumers at any stage[3]. MAE accounts for about 1/4 of medical error events and is an integral part of safety management[4]. Many MAEs may be minimal, with little clinical significance or no adverse effect on the patient; tragically, however, some may lead to patient potential or direct health damage, prolonged hospital stay, or even death. In addition, MAE can increase the medical expenses for patients or hospitals and undermine the public's confidence in the medical services they provide in hospitals[5,6]. Globally, the annual cost of MAE reaches as high as 420 billion US dollars, accounting for nearly 0.7% of the total medical expenses worldwide; it is recognized as a public health and safety concern[2].

Critiquing the person involved in errors or encouraging them to be more careful does not prevent errors from occurring, as it does not change the fundamental conditions that lead to errors[6]. Identifying and analyzing the cause of MAE may be helpful to modify the management loophole, take active preventive measures, and improve the safety of drug use[7-10]. However, reliance on accurate and voluntary user reporting may be the key to analyzing MAE and be an essential strategy for medication safety management[11].

In hospitals, MAE is the most common type of medication error. Rehan's study showed that 5 medication errors occur per 100 administrations[12]. The rates of MAE were reported at 41.6%–70% in Saudi Arabia and 41%-46% in Iran[13，14]. Nurses are crucial in reporting and preventing MAE. They are the last line of defense for safe medication use in the medication management chain, including identifying and avoiding errors as well as errors made by physicians, pharmacists, and other healthcare providers[15]. Nursing staff voluntarily reporting and actively summarizing experiences from error reporting may be the primary means to reduce the incidence of medication errors or improve the safety of medication use[7]. Therefore, it is extremely essential to encourage and pay attention to nurses' reporting of MAE. However, disappointingly, studies show that nurses face many barriers when reporting MAE.

According to Vrbnjak's investigation, only 37% to 67% of medication errors are reported by nurses[14, 16].

Previous studies have shown that work environment, personnel relations, management measures, organizational level, and other factors were the impact factors of barriers to nurses' MAE reporting[17,18]. According to our knowledge, the research on the barriers to and influencing factors of nurse MAE reporting needs to be more comprehensive in China, primarily since unique factors such as regional culture must be addressed. According to Hofstede's survey data, organizations such as China, Singapore, and South Korea have higher power distance values and belong to countries with high power distances relative to most countries in the United States and Europe. For example, China's power distance value is 80, but the United States is 40[19]. Besides, it is worth noting that of particular interest is that Chinese organizations tend to have "Paternalistic" leadership; the managers are often seen as omnipotent elders[20]. Influenced by organizational culture, reporting barriers and influencing factors may have cultural characteristics in the Chinese nurse[21,22]. Identifying the barriers to MAE reporting and the factors influencing reporting barriers, including cultural traits, may provide strategic assistance for the safe drug administration of nurses in China. To this end, we focused on the impact of work environment, power distance, and face-saving on nurses' MAE reporting barriers in China.

Previous studies have shown that the better the hospital working environment, the more likely nurses are to report adverse medical events voluntarily[21,23,24]. Nurses may be less willing to take the time to fill out reports of medication errors with insufficient hardware, lack of space, limited medical supplies, etc., as this situation may have led to much extra time spent on non-nursing work[25,26]. In addition, a positive organizational culture can also positively influence nurses' intention to report MAE[27].

The power distance refers to the individual's acceptance of the unequal distribution of power in the organization and the emotional distance between the

superior and the subordinate[28]. Under the influence of Chinese traditional culture, the relationship between superiors and subordinates is more vertical; subordinates may have a higher power distance, Particularly in women-led organizations with a single gender subject[29,30]. At the same time, individuals with high power distances may tend to rely on their superiors' attitude when making decisions[31,32]. Based on cultural traditions and nursing organizational characteristics, hospital policies may encourage nurses to report medication errors, but high power distance structures may be a hindrance.

Goffman believes that face is the positive social image people strive to win in specific social interactions[33]. In China, "face" originates from "shame culture" and has an undeniable dominance or influence on the behavior of Chinese people[34]. To achieve harmony and avoid group conflict, the Chinese will pay more attention to saving face in interpersonal communication[35]. MAE belongs to adverse events or errors. Reporting MAE may not only damage one's colleagues or the organization's face but also pose a threat to team harmony. Nurses may be less likely to report MAE proactively to preserve their or colleagues' or the group's face. Therefore, face-saving may be another critical factor hindering MAE reporting by Chinese nurses[21,36].

**Present study**

Our study aims to understand the barriers reported by Chinese nurses and the impact of work environment, power distance, and face-saving on MAE reporting barriers. The research findings are crucial for enriching the current literature on nurse-reported barriers to MAE. Still, they also offer strategic assistance for hospital nurses who are safe for medication management. Based on existing research and theory, we propose three specific hypotheses. Hypothesis 1: The main factors influencing reporting barriers for Chinese nurses in MAE are work environment, power distance perception, and face-saving. Hypothesis 2: Power distance perception and face engineering were significantly and positively associated with reporting disability in medical errors among Chinese nurses. Hypothesis 3: Work environment significantly correlates negatively with reporting barriers for Chinese nurses in MAE.

## METHODS

## Study Design and Setting

This was a cross-sectional study. Data were collected from September 2022 to November 2022 across a tertiary hospital in Chengdu, China. The anonymous questionnaire used the software "questionnaire star," was opened to all nurses; filled out and submitted was considered voluntary participation.

## Measurement

Participation was voluntary, and participants were informed prior to starting the survey that all data collected was non-identifiable and would only be used for research purposes. Before the survey, trained professionals provided uniform and neutral explanations to answer questions or inquiries. The questionnaire stipulates that each individual can only respond once to ensure a 100% consent rate and prevent multiple responses. The study obtained approval from the Ethics Committee of the Sixth People's Hospital of Chengdu, China（No: 2021-L-009）. The questions explored the following four themes:

**1.** Demographic variables

The self-designed demographic questionnaire was utilized in this study to collect the characteristics of participants, including gender (male, female), age, Marital status (Married, Single, Others), Positional rank (Nurse, Nurse practitioner, Nurse-in-charge and above), educational background (college degree, bachelor's degree, or graduate degree) and length of nursing service were collected.

**2.** Barriers to MAE Reporting Questionnaire（BMAERQ）

The BMAERQ was initially developed by Wakefield et al.[37], and the Chinese version was translated and validated by Chiang et al.[21]. The questionnaire measures the barriers to nurse reporting through "Why there are no reports of MAE", with a total of 16 items, including three sub-scales: Fear (six items), reporting process (six items), and administrative barriers (four items). The scoring uses a Likert 6-point scale, with positive scoring (1 = strongly disagree, 6 = strongly agree), and higher scores indicate that nurses perceive more reporting barriers. In previous studies, It's indicating good reliability and validity; the retest reliability and content validity were

0.727 and 0.899, respectively, and *Cronbach's α* was 0.880[21]. In this study, the *Cronbach's α* of this questionnaire was 0.940.

**3.** Face-Concern Scale (FC) and Index of Hierarchy of Authority questionnaire (C-IHA)

FC and C-IHA questionnaires were developed by Chinese scholar Chiang[21]. FC consists of 4 items used to assess the degree to which nurses are concerned with and maintain the face-saving needs of their colleagues in reporting errors, such as "Reporting can make colleagues who make mistakes feel embarrassed". C-IHA consists of 6 items used to assess the power distance nurses feel in decision-making, such as "Any decision we make must be approved by the nurse manager/leader". Both questionnaires use a Likert 6-point rating scale, with positive scoring (1 = strongly disagree, 6 = strongly agree); higher scores indicate a higher degree of concern and maintenance of colleagues' faces or a higher perceived power distance. Both questionnaires use a Likert 6-point rating scale, with positive scoring (1 = strongly disagree, 6 = strongly agree), where higher scores indicate a higher degree of concern and maintenance of colleagues' faces or a higher perceived power distance. Two questionnaires have good reliability and validity, with *Cronbach's α* of 0.70 for the FC scale and 0.80 for the C-IHA questionnaire in previous studies[21]. In this study, *Cronbach's α* for the FC scale is 0.861, and *Cronbach's α* for the C-IHA questionnaire is 0.795.

**4.** Work Environment Questionnaire (WEQ)

WEQ was designed by Blegen et al.[38]. The Chinese version was translated and validated by Jiang et al.[39] and used to measure nurses' perception of the working environment in the hospital or department. The Chinese version of the questionnaire contains 19 items, divided into four dimensions: medical configuration, human resources, quality management, and colleague relationships. The questionnaire uses the Likert 5-point scoring method, with positive scoring ("1" means strongly disagree, "5" means strongly agree); the higher the score, the more satisfied the nurse is with the working environment of the department or hospital. In previous studies, the *Cronbach's α* of the questionnaire was 0.61~0.78[21,38,39]. The *Cronbach's α* in this

study was 0.837.

**Participants**

The hospital where the participants are located is a tertiary class A comprehensive academic institution hospital in southwestern China. The hospital's staff consists of 1,578 health and administrative personnel, among which there are more than 600 nursing professionals. 444 nurses who met the research criteria were invited to participate in this study. The standards included: 1. Obtaining a professional qualification certificate from the People's Republic of China; 2. Having at least 1 year or more of clinical nursing experience; 3. Nurses directly involved in medication therapy or medication management; 4. Nurses voluntarily participated in this study. Nurses who failed to complete the investigation were excluded.

**Patient and public involvement**

As this study focussed on clinical nurses, patients or the general public were not involved in the study design.

**Statistical analysis**

This study used Excel 2019 and SPSS 26.0 (IBM, Armonk, NY, USA) for data entry and analysis. The Harman single-factor test was used to test for common method bias. Metric data was represented by mean ± standard deviation, while count data was represented by frequency and percentage. The differences in characteristics between variables were compared using independent sample t-tests or chi-square tests, and pairwise comparisons between multiple data sets were compared using the LSD method. The correlation between measurement data and barriers to MAE Reporting was analyzed using Pearson correlation; the main influencing factors of Barriers to MAE Reporting were analyzed using multiple linear regression, the "stepwise" method to perform regression analysis on the influencing factors of the Barriers to MAE Reporting ($\alpha$ inclusion $\leq 0.050$,$\alpha$ exclusion $\geq 0.100$), variables are significant in the t-test, chi-square test, or correlation analysis results significance were included. The significance level was set at $\alpha = 0.05$ (two-tailed).

**Results**

432(97.30%) nurses answered in the electronic questionnaire. According to

Harman's single-factor test results, there are 11-factor eigenvalues greater than 1. The explanatory rate of the first common factor is 30.080%, which is less than the critical value of 40%, indicating no apparent standard method bias in this study[40].

**Demographic characteristics**

Table 1 shows the demographic variables and their relationship to the BMAERQ scores. The majority of participants were females (n = 408,94.4%), with a mean age of 33.16(SD = 7.84), more than 60.0% were married (n = 297,68.8%), and most nurses with The intermediate professional rank (n =335,77.5%). The Barriers to MAE Reporting score has statistically significant differences among age groups, work experience, job titles, and marital status, but not among the genders and educational backgrounds.

**Table 1. Demographic characteristics of research objects (*n*=432)**

| Variable | Sample *n (%)* | BMAERQ scores *Mean (SD )* | *t/F* | *P* |
|---|---|---|---|---|
| **Gender** | | | -0.804 | 0.422 |
| Male | 24(5.6) | 45.5(21.13) | | |
| Female | 408(94.4) | 48.24(15.9) | | |
| **Age(years)** | | | -2.746 | **0.006** |
| ≤30 | 190(44) | 45.65(17.36) | | |
| ＞30 | 242(56) | 50(15.02) | | |
| **Length of nursing work （years）** | | | -4.304 | **＜0.001** |
| ≤10 | 225(52.1) | 44.95(16.82) | | |
| ＞10 | 207(47.9) | 51.5(14.83) | | |
| **Education** | | | -0.235 | 0.815 |
| Below bachelor degree | 183(42.4) | 47.87(16.2) | | |
| Bachelor degree or above | 249(57.6) | 48.25(16.26) | | |
| **Positional ranks** | | | 5.951 | **0.003** |

| | | | | |
|---|---|---|---|---|
| Nurse | 40(9.3) | 40.15(15.92)[b] | | |
| Nurse (Junior) | 57(13.2) | 46.84(20.1)[a] | | |
| Supervisor Nurse (Intermediate) | 335(77.5) | 49.25(15.26)[a] | | |
| **Marital status** | | | 6.584 | **0.002** |
| Unmarried | 119(27.5) | 43.58(15.74)[b] | | |
| Married | 297(68.8) | 49.88(16.39)[a] | | |
| Divorced or widowed | 16(3.7) | 48.31(8.79)[ab] | | |

LSD was used for multiple comparisons, and the differences between groups were labeled with letters

**Barriers to MAE reporting**

The results showed that nurses' standardized scores of barriers to MAE reporting were 3.01(SD = 1.01), the Fear dimension items have the highest standardized score of 3.42（SD = 1.11）, the Administrative barriers were 2.95（SD = 1.17）， and the Reporting process was 2.63（SD = 1.07）." Administrators' responses to MAE do not match the severity of the errors" 、" Disagreement over MAE" 、" Adverse consequences from reporting" have the higher standardized scores, respectively. As shown in Table 2.

Table 2 Barriers to MAE reporting scores（*n*=432）

| Variable | Group *Mean (SD)* | Standardized *Mean (SD)* | Item *Mean (SD)* |
|---|---|---|---|
| **Fear** | 20.53（6.68） | **3.42（1.11）** | |
| 11. Adverse consequences from reporting | | | **3.66(1.46)** |
| 1. Not recognize MAE occurred | | | 3.43(1.55) |
| 8. Being blamed for MAE results | | | 2.97(1.37) |
| 3. Physicians' reprimand | | | 2.96(1.39) |
| 7. Being recognized as incompetent | | | 2.86(1.39) |

| | | | |
|---|---|---|---|
| 10. Patient's negative attitude | | | 2.75(1.36) |
| **Administrative Barriers** | 11.79（4.68） | 2.95（1.17） | |
| 12. Administrators' responses to MAE do not match the severity of the errors | | | **4.03(1.42)** |
| 15. Much emphasis on MAE as nursing quality provided | | | 3.03(1.43) |
| 14. No positive feedback | | | 2.94(1.40) |
| 16. Focus on individual rather than system factors to MAE | | | 2.52(1.21) |
| **Reporting Process** | 15.78（6.41） | 2.63（1.07） | |
| 2. Disagreement over MAE | | | **3.86(1.52)** |
| 5. Too much time for filling reports | | | 3.42(1.49) |
| 9. Unrealistic expectation for administrating drugs correctly | | | 3.14(1.44) |
| 6. Think MAE not important enough to be reported | | | 2.81(1.37) |
| 13. Unclear MAE definition | | | 2.69(1.35) |
| 4. Too much time for contacting physicians | | | 2.05(1.31) |
| **Barriers to MAE reporting** | 48.09（16.22） | 3.01（1.01） | |

## Correlation analysis

The survey results showed that WEQ is negatively correlated with Barriers to MAE Reporting (r= -0.201, P< 0.01); FC (r= 0.866, P< 0.01), C-IHA (r= 0.799, P< 0.01) are positively correlated with Barriers to MAE Reporting, as shown in Table 3.

Table 3 Barriers to MAE reporting correlation analysis ($n$ = 432)

| Variable | Mean | SD | WEQ *r(P)* | FC *r(P)* | C-IHA *r(P)* | BMAERQ *r(P)* |
|---|---|---|---|---|---|---|
| WEQ | 77.06 | 77.06 | 1 | | | |
| FC | 12.5 | 12.5 | -0.161** | 1 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| C-IHA | 19.52 | 19.52 | -0.113* | 0.702** | 1 | |
| BMAERQ | 48.09 | 48.09 | -0.201** | 0.866** | 0.799** | 1 |

**Multivariate regression analysis**

The multivariate regression analysis results showed that age, length of nursing work, positional ranks, marital status, FC, C-IHA, and WEQ were analyzed as independent variables. The results showed that FC, C-IHA, and WEQ were the influencing factors of Barriers to MAE Reporting, which could explain 82.4% of the variation in reporting barriers ($R^2 = 0.826$, $R^2adj = 0.824$, $F = 253.665$, $P < 0.001$), as shown in Table 4.

Table 4 Multiple regression analysis of Barriers to MAE reporting ($n = 432$)

| Variable | *B* | *β* | *t* | *P* | *VIF* |
|---|---|---|---|---|---|
| Constant | 11.851 | - | 3.818 | ＜0.001 | - |
| FC | 2.012 | 0.591 | 20.715 | ＜0.001 | 2.127 |
| C-IHA | 1.004 | 0.377 | 13.303 | ＜0.001 | 2.035 |
| WEQ | -0.111 | -0.063 | -3.088 | 0.002 | 1.973 |

Dependent: Barriers to MAE reporting; ”-”: blank entry

## Discussion

This study explores the current status and influencing factors of reporting barriers for Chinese nurses regarding MAE. We found that Fear is the main obstacle that hinders nurses from reporting MAE, including Fear of being reprimanded or punished, being perceived as incompetent, and Fear of negative attitudes from managers, colleagues, and patients. It's consistent with Chiang et al.'s report[21,41]. Similarly,there are also research reports that reporting MAE for oneself or others may lead to anxiety, shame, guilt, and other psychological issues[42]. Therefore, managers must adjust their attitudes and responses toward nurses' medication errors and focus on creating a harmonious departmental atmosphere.On the one hand, managers can find the cause of medication errors from a systemic organizational perspective when reporting them. The approach of not blaming or blaming individuals may positively affect nurses' reporting of MAE[18]. On the other hand, establishing and implementing

a voluntary reporting error incentive mechanism is also necessary. It may help enhance nurses' candid reporting of MAE[43]. In addition, establishing smooth and effective reporting channels and reducing administrative barriers to reporting may also increase nurses' proactive reporting of MAE[44].

Secondly, in this study, nurses' demographic characteristics had no significant impact on the reporting barriers of MAE. The work environment was negatively correlated with nurse-reported obstacles, serving as a protective factor for MAE reporting. This is consistent with our research hypothesis and the majority of previous studies[21,24,26]; the better the working environment in the hospital, the fewer obstacles nurses voluntarily report after medical incidents. However, it is worth noting that the correlation between the work environment and reporting barriers in our study is relatively weak, consistent with Chiang[21], but much lower than the research results of Dalky et al. Their research reported that the work environment explained 65.1% of variations in nurses' MAE reporting[26]. The differences in research results may be related to the cultural characteristics of different countries, the sources of the nurses participating in this survey and the environmental conditions of the hospitals where the surveyed nurses are located. In this study, the survey subjects come from the same hospital, where the allocation of organizational resources, cultural atmosphere, and the representativeness and diversity of management may need to be increased. Future research could be conducted in different types of hospitals to determine the impact of the work environment on reporting barriers to medication errors among nurses.

Furthermore, as expected, power distance and face saving are negatively correlated with nurse reporting barriers, an essential factor affecting medication errors reported by Chinese nurses, consistent with Chiang and Yang's research reports[21,22]. In the traditional cultural atmosphere of China, due to face-saving concerns, nurses may be unwilling to expose their mistakes in front of colleagues or willing to save colleagues' faces, choosing not to report their own or others' MAE. China is also a country with high power distance, where nursing organizations are predominantly female and tend to adopt a paternalistic management style. Nurses may have a higher level of power distance perception towards organizations. They may rely more on

department managers to make decisions regarding error reporting. Therefore, the considerations of face-saving and the perception of power distance could seriously hinder the reporting of MAE[45]. Reducing face and power distance and establishing a safe and valued fair organizational culture may help Chinese nurses report barriers to medication errors and may also be a key supporting factor for medication safety[46-48]. For example, establishing a particular management group that optimizes the reporting management system for nurses' MAE and manages people or things through the system may be beneficial in reducing face-saving. It may also help reduce the control of managers over subordinates and the power-distance barriers for nurses in reporting MAE[49]. Especially for nursing management organizations that are predominantly female, reducing power distance may have more significant implications[50].

**Limitations**

This study is cross-sectional; causal relationships between variables must be carefully determined. The study only includes nurses from a tertiary hospital in Chengdu. Due to the influence of cultural or regional factors, the generalization of the conclusions may be limited. Future research should be expanded to verify and extend our results among populations from different regions and ethnic groups. This study focuses on the impact of cultural characteristics and work environment on nurses' reporting barriers and other factors that may influence or moderate nurses' reporting barriers. Future research could consider including potential influencing factors for study.

**Conclusion**

In short, our study identified the main barriers reported by Chinese nurses in MAE and the critical influencing factors of these barriers. Face-saving and power distance were the main risk factors reported by Chinese nurses in MAE. At the same time, the work environment was a protective factor, but with a lesser impact. Improving the nurses' work environment may help reduce the barriers reported in MAE. Still, more importantly, hospital administrators need to take adequate measures to reduce nurses' face-saving and power distance, which may be more helpful in reducing the barriers reported in MAE and improving medication safety management

in hospitals. This study enriches the current research findings on barriers to nurse reporting, which also provides strategic support for the management of safe medication use by hospital nurses and has important theoretical and practical implications.

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**Authors' contributions**

Yang L, Peng X, Song W, and Wu D were involved in all aspects of the study, including design, analysis, interpretation of data and preparation of the manuscript. Su H was involved with the design of the study and interpretation of data. Yang S and Wang C were involved with the interpretation of data and preparation of the manuscript. All authors contributed to intellectual content during the drafting and revision of the work and approved the final version of the manuscript. Wu D is the guarantor.

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**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval and consent to participate**

The study obtained approval from the Ethics Committee of the Sixth People's Hospital of Chengdu, China (approval number 2021-L-009). Respondents were informed before starting the survey that study participation was voluntary, and completion of the questionnaire was considered informed consent.

**Availability of data and materials**

The data used and analyzed during the current study are available from the corresponding author on reasonable request. The data are not publicly available due to privacy or ethical restrictions.

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